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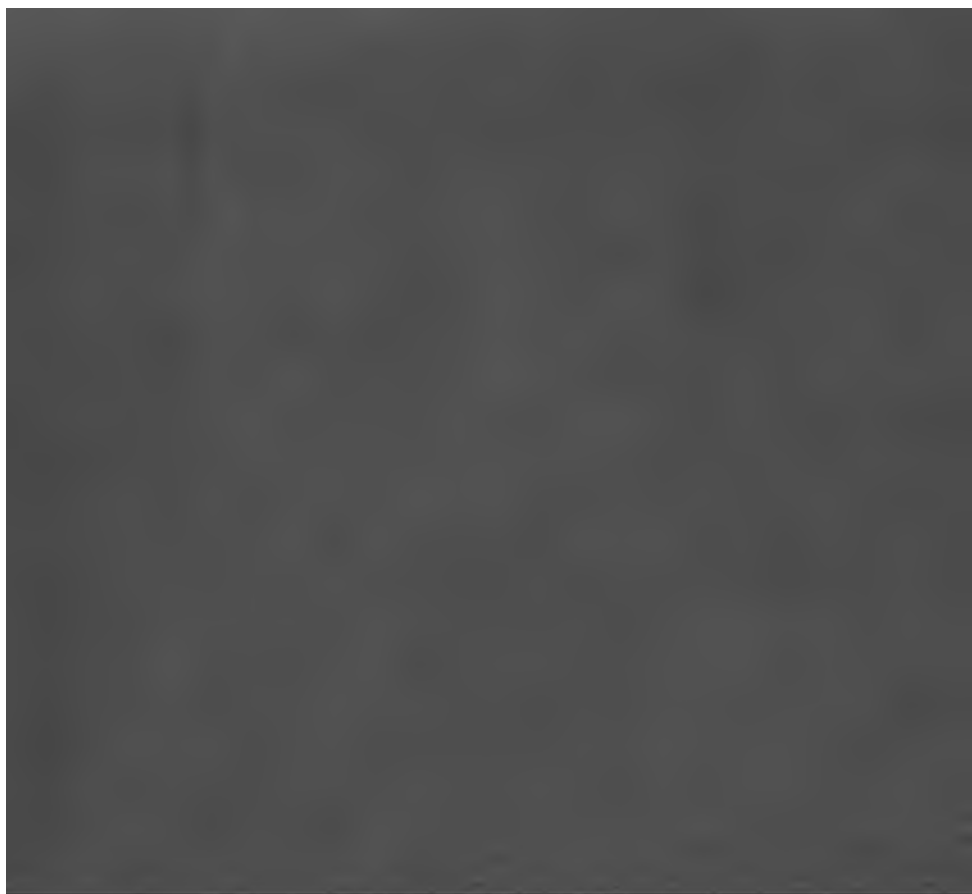
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# SOLUBILITIES

OF

## INORGANIC AND ORGANIC SUBSTANCES

*A HANDBOOK OF THE MOST RELIABLE  
QUANTITATIVE SOLUBILITY  
DETERMINATIONS*

RECALCULATED AND COMPILED BY

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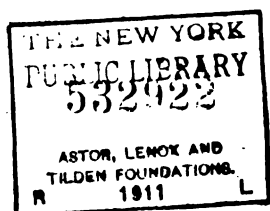
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## PREFACE

DURING the years which have elapsed since Professor Arthur M. Comey's admirable "Dictionary of Chemical Solubilities" went to press (March, 1894), the literature upon solubilities has grown to such an extent that it has appeared desirable to make a new compilation of it. Soon after beginning work upon this volume the author realized that it would not be possible to prepare a compilation of solubility results which would fulfill completely the various requirements of theoretical, technical, analytical, and other classes of chemists, and he has therefore endeavored to meet some of the needs of all chemists rather than provide information especially arranged for any particular class.

The following features have been considered of chief importance in preparing the present compilation: completeness of the data, reliability of the determinations, uniformity in expression of results, convenience of arrangement of material, and the indexing of the cross-references to tables.

The material has been collected almost entirely from the original sources, and not from text-books or works of reference. The plan followed has been to search diligently the tables of contents or indices of twenty-five of the principal chemical journals issued since 1875, and to consult all articles in these as well as in other journals to which references could be obtained. In this connection, however, it should be stated that indexed references to work on solubility usually appear under the name of the substance employed, and not under the heading "solubility." Furthermore, solubility determinations are often incidental to other investigations, and consequently are not indicated in the title of the article or included in the index of the journal. Considering these difficulties there can be little hope of making such a compilation complete in every detail, and in the present case the best that can be said is that an earnest effort has been made to omit nothing of importance. This has been done not only for the author's personal satisfaction in perfecting the work, but also to give the reader a reasonable assurance that the absence from these pages of results upon a particular substance is good evidence that such determinations of satisfactory reliability

## PREFACE

are not readily obtainable from the usually accessible chemical journals.

Although at the time Professor Comey compiled his book it appeared inadvisable to attempt, in the majority of cases, to select the most reliable determinations of the solubility of the same substance reported by different investigators, the present author believes that this can now be done with advantage. The selections have been made in all cases by calculating the available determinations to a common basis and drawing curves through the points plotted on cross-section paper. A comparison of the curves, together with a study of the details of the methods by which the determinations were made in the several cases, has usually furnished clear evidence for a reliable selection. For some substances, however, this plan could not be followed, and it has therefore been necessary to present two or more sets of disagreeing results.

In many instances the calculations and study necessary to ascertain the most reliable figures have required much labor, and perhaps in some cases the author has not succeeded in selecting the ones nearest the truth; but it is believed that the economy of space required to present the material, and the saving of the time of the reader in making the necessary selections himself, will far overbalance the disadvantage resulting from the accidental inaccuracies introduced through extended computations.

An additional advantage resulting from the recalculation of different determinations to a common basis is the increased uniformity in the expression of results throughout the volume. On this account it has been possible to give the solubility of most substances for regular intervals of temperature and in terms of weight of dissolved substance per given weight of solvent or of solution.

Quantitative results alone have been included in this compilation, since it is assumed that qualitative determinations, if desired, can be readily made by simple tests in the laboratory, and therefore the effort necessary to collect such observations from the literature is out of proportion to the value of the information obtained.

In regard to the names and formulas of the compounds included, the author wishes to say that they are, for the most part, given as found in the original papers from which they were taken; and in some cases a lack of uniformity in the manner of their

## PREFACE

expression will be noted. This is especially true of the molecules of water of crystallization in the formulas given in connection with the guide names placed in heavy type at the head of the tables for all substances considered. As is well known, many compounds, besides gaining or losing water in air, also crystallize with different numbers of molecules of water even at the ordinary temperature, and it was therefore thought best to include such information at the proper place in the tables under the heading "Solid Phase" rather than to select in doubtful cases the number of molecules of water which the particular substance was considered to carry under ordinary conditions.

Although the arrangement of the material is alphabetical according to the customary English names, an index has been added which also provides for those cases where there appears a doubt as to which name is preferable, and furnishes cross-references to those tables which contain results upon more than one substance.

A glance through the pages of this book will show the incompleteness of the data for many of the most common chemical compounds. Furthermore many of the results given are of doubtful accuracy, although the best available. It is hoped, therefore, that a realization of the present incomplete state of our information concerning solubilities as evidenced in these pages will stimulate investigations of many of those substances which have hitherto been studied incompletely or not at all.

This volume went to press January 1st, 1907, and the subject matter is brought up to November, 1906.

In conclusion, the author begs all indulgence for errors and omissions, and will thank any one for calling them to his attention or making suggestions such as would improve a possible future edition of this "Handbook."

A. S.

WASHINGTON, D.C., Feb. 22, 1907.





## ABBREVIATIONS

Abs. — Absolute.  
Abs. Coef. — Absorption Coefficient.  
Aq. or aq. — Aqueous.  
At. — Atmosphere.  
b. pt. — Boiling Point.  
cc. — Cubic Centimeter.  
conc. — Concentrated.  
*d.* — Dextro.  
*d<sub>s</sub>* — Density.  
f. pt. — Freezing Point.  
G., g., or gm. — Gram.  
Gms. or gms. — Grams.  
G.M. or Gm. Mol. — Gram Molecule.  
*l.* — Laevo.  
*m.* — Meta.  
Mg. or mg. — Milligram.  
Mgs. or mgs. — Milligrams.  
Mg. Mol. — Milligram Molecule.  
Millimols. — Milligram Molecules.  
Mol. — Molecule.  
m. pt. — Melting Point.  
N. or n. — Normal.  
*o.* — Ortho.  
ord. — Ordinary.  
*p.* — Para.  
ppt. — Precipitate.  
pptd. — Precipitated.  
pt. — Part.  
sat. — Saturated.  
sol. — Solution.  
Sp. Gr. — Specific Gravity.  
*t*<sup>°</sup>. — Temperature in degrees C.  
temp. — Temperature.  
vol. — Volume.  
wt. — Weight.



## ABBREVIATIONS OF TITLES OF JOURNALS

- Am. Ch. J. The American Chemical Journal, Baltimore.  
 Am. J. Sci. American Journal of Science and Arts, New Haven.  
 Analyst. The Analyst, London.  
 Ann. See Liebig's Ann.  
 Ann. chim. anal. appl. Annales de chimie analytique appliquée, Paris.  
 Ann. chim. phys. Annales de chimie et de physique, Paris.  
 Ann. Physik. Annalen der Physik und Chemie, Leipzig. See also Pogg.  
 Ann. and Wied. Ann.  
 Apoth.-Ztg. Apotheker Zeitung, Berlin.  
 Arch. Pharm. Archiv der Pharmacie, Halle.  
 Ber. Berichte der deutschen chemischen Gesellschaft, Berlin.  
 Biedermann's Centr. Biedermann's Centralblatt für Agrikulturchemie,  
 u. s. w., Leipzig.  
 Bull. soc. chim. Bulletin de la société chimique de Paris.  
 Chem. Centralbl. Chemisches Centralblatt, Berlin.  
 Chem. Ind. Die Chemische Industrie, Berlin.  
 Chem. News. The Chemical News, London.  
 Chem.-Ztg. Chemiker Zeitung, Cöthen.  
 Compt. rend. Comptes rendus hebdomadaires des Seances de l'Academie  
 des Sciences, Paris.  
 Dingler pol. J. Dingler's polytechnisches Journal, Stuttgart.  
 Gazz. chim. ital. Gazzeta chimica italiana, Palermo.  
 Jahresber. Chem. Jahresbericht über die Fortschritte der Chemie, Giessen.  
 J. Am. Chem. Soc. Journal of the American Chemical Society, Easton.  
 J. Anal. Chem. The Journal of Analytical and Applied Chemistry, Easton.  
 J. Chem. Soc. Journal of the Chemical Society of London.  
 J. pharm. chim. Journal de pharmacie et de chimie, Paris.  
 J. Physic. Chem. Journal of Physical Chemistry, Cornell.  
 J. pr. Chem. Journal für praktische chemie, Leipzig.  
 J. russ. phys. chem. Ges. Journal of the Russian Chemical Society, St.  
 Petersburg.  
 J. Soc. Chem. Ind. Journal of the Society of Chemical Industry, London.  
 Landw. Vers-Stat. Landwirthschaftlichen Versuchs-Stationen, Berlin.  
 Liebig's Annalen. Justus Liebig's Annalen der Chemie, Leipzig.  
 Monatsh. Ch. Monatshefte für Chemie, u. s. w., Vienna.  
 Mon. Sci. Le Moniteur Scientifique, Paris.  
 Mulder. Scheikundige Verhandelingen en Onderzoekingen, Vol. 3, Pt. 3.  
 Bijdragen tot de Geschiedenis van Het Scheikungig Gebonden Water by  
 G. J. Mulder, Rotterdam, 1864.  
 Pharm. J. Pharmaceutical Journal and Transactions, London.  
 Phil. Mag. The Philosophical Magazine, London.  
 Physic. Rev. Physical Review, Cornell.  
 Pogg. Ann. Annalen der Physik und Chemie, edited by Poggendorf. See  
 also Ann. Physik and Wied. Ann.  
 Proc. Am. Acad. Proceedings of the American Academy of Arts and  
 Sciences, Boston.  
 Proc. Roy. Soc. Proceedings of the Royal Society of London.  
 Rec. trav. chim. Recueil des travaux chimiques des Pays-Bas, Leiden.  
 Sitzber. Akad. Wiss. Berlin. Sitzungsberichte der königlichen preussischen  
 Akademie der Wissenschaften zu Berlin.  
 Sitzber. Akad. Wiss. Wien. Sitzungsberichte der mathematische naturwissen-  
 schaftlichen classe der kaiserlichen Akademie der Wissenschaften zu  
 Wien.  
 U. S. P. Pharmacopoeia of the United States, 8th Revision, 1900.

## ABBREVIATIONS OF TITLES OF JOURNALS

- Wied. Ann. Annalen der Physik und Chemie, edited by Wiederman. See also Pogg. Ann. and Ann. Physik.  
 Wiss. Abh. p. t. Reichsanstalt. Wissenschaftlichen Abhandlung der physikalische technische Reichstalt, Charlottenburg.  
 Z. anal. Chem. Zeitschrift für analytische Chemie, Wiesbaden.  
 Z. angew. Chem. Zeitschrift für angewandte Chemie, Berlin.  
 Z. anorg. Chem. Zeitschrift für anorganische Chemie, Hamburg and Leipzig.  
 Z. Elektrochem. Zeitschrift für Elektrochemie, Halle.  
 Z. Krystallogr. Zeitschrift für Krystallographie und Mineralogie, Leipzig.  
 Z. physik. Chem. Zeitschrift für physikalische Chemie, Leipzig.  
 Z. Ver. Zuckerind. Zeitschrift für Rubenzucker-Industrie, Berlin.

The above abbreviations with a few necessary exceptions are taken from the list adopted by the editor of the *Journal of the American Chemical Society* for the new abstract journal, "Chemical Abstracts," and will in general be familiar to many of those who use this volume. In a large number of instances Chem. has been contracted to Ch., but with this exception, and possibly a few inaccuracies which have slipped in, the abbreviations of journal titles used in this book conform to the above list.

**ACENAPHTHENE**  $C_{12}H_{10}$ .**SOLUBILITY IN SEVERAL ORGANIC SOLVENTS.**(Speyers — *Am. J. Sci.* [4] 14, 294, 1902.)

NOTE. — In the original paper the results are given in terms of gram molecules of acenaphthene, acetamide, acetanilide, etc., per 100 gram molecules of solvent, at temperatures which varied with each solvent and with each weighing of the solutions. The tabulated results here given were obtained by recalculating and reading the figures from curves plotted on cross section paper.

t °.	In Methyl Alcohol.			In Ethyl Alcohol.			In Propyl Alcohol.		
	(a)*	(b)*	(c)*	(a)	(b)	(c)	(a)	(b)	(c)
0	81.33	1.80	0.39	81.1	1.9	0.57	82.3	2.26	0.88
10	80.40	1.70	0.38	80.3	2.8	0.84	81.8	2.40	1.00
20	79.60	2.25	0.48	79.6	4.0	1.20	81.4	3.40	1.35
30	79.00	3.50	0.72	79.1	5.6	1.70	80.9	4.75	1.90
40	78.45	6.00	1.20	78.7	8.4	2.60	80.6	7.10	2.90
50	78.15	9.00	1.77	78.8	13.2	3.90	80.7	11.10	4.40
60	78.30	11.70	2.35	79.4	23.2	7.00	81.5	19.60	8.20
70	78.60	14.30	2.90	80.75	40.5	12.50	83.9	37.60	16.20

t °.	In Chloroform.			In Toluene.		
	(a)	(b)	(c)	(a)	(b)	(c)
0	143.8	16.4	12.7	90.7	13.18	7.9
10	140.1	20.6	16.0	90.8	18.0	10.7
20	136.3	27.0	19.5	91.0	24.5	14.5
30	132.4	34.0	25.0	91.8	33.5	20.5
40	128.0	42.5	32.0	92.7	47.0	28.0
50	123.4	51.5	40.0	94.0	60.5	35.7
60	119.3	62.5	50.0	95.5	74.0	43.5
70	...	...	...	97.2	89.0	52.5

**ACETAMIDE**  $CH_3CO.NH_2$ .**SOLUBILITY IN WATER AND IN ALCOHOL.**

(Speyers.)

t °.	In Water.			In Ethyl Alcohol.		
	(a)	(b)	(c)	(a)	(b)	(c)
0	105.5	70.8	29.6	85.62	17.3	18.5
10	104.9	81.0	34.0	86.2	24.0	26.0
20	104.3	97.5	40.8	87.3	31.5	33.8
30	103.7	114.0	47.7	88.8	40.5	43.0
40	103.0	133.0	55.5	90.7	50.0	53.5
50	102.3	154.0	64.0	93.0	61.0	64.5
60	101.6	177.5	74.0	95.5	72.0	76.5

**ACETANILIDE**  $C_6H_5NH.COCH_3$ .100 grams  $H_2O$  dissolve 0.55 gram at 25°, and 5.55 grams at b. pt.

- \* (a) Weight of 100 cc. solution in grams. \* (b) Grams dissolved substance per 100 grams solvent.  
 \* (c) Gram molecules of dissolved substance per 100 gram molecules of solvent.

# ACETANILIDE

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## SOLUBILITY OF ACETANILIDE IN ORGANIC SOLVENTS. (Speyers.)

t°.	In Methyl Alcohol.			In Ethyl Alcohol.			In Chloroform.		
	(a)	(b)	(c)	(a)	(b)	(c)	(a)	(b)	(c)
0	86.0	22.7	5.4	84.2	14.7	5.0	150.3	3.66	3.24
10	86.4	30.0	7.0	84.4	20.0	6.6	147.5	7.80	7.00
20	87.5	41.0	9.8	85.0	27.0	9.0	144.0	12.00	10.50
30	89.2	54.0	13.2	86.0	36.0	12.2	139.8	17.0	15.0
40	91.1	75.5	18.0	87.4	49.0	16.2	135.4	23.0	20.4
50	93.2	107.0	25.2	89.5	65.0	22.0	131.4	31.0	27.6
60	95.7	145.0	34.0	92.0	87.0	30.0	127.2	41.0	36.0

## SOLUBILITY IN MIXTURES OF ETHYL ALCOHOL AND WATER AT 25°. (Holleman and Antusch — Rec. trav. chim 13, 293, 1894.)

Vol. % Alcohol.	Gms. C <sub>6</sub> H <sub>5</sub> NO per 100 Gms. Solvent.	Sp. Gr.	Vol. % Alcohol.	Gms. C <sub>6</sub> H <sub>5</sub> NO per 100 Gms. Solvent.	Sp. Gr.
100	32.93	0.8512	55	13.13	0.9335
95	36.65	0.8737	50	9.74	0.9396
93	38.04	0.8813	45	7.25	0.9449
90	38.20	0.8896	40	5.10	0.9508
87	37.80	0.8959	35	3.58	0.9567
85	36.83	0.8996	31	2.56	0.9617
80	33.62	0.9072	25	1.73	0.9683
75	29.25	0.9133	20	1.30	0.9736
70	24.73	0.9185	15	1.03	0.9795
65	20.42	0.9185	10	0.94	0.9845
60	16.51	0.9287	0	0.54	0.9970

# ACETIC ACID CH<sub>3</sub>COOH.

## SOLUBILITY IN WATER. (Dahms — Ann. Phys. [4] 60, 122, '97.)

t°.	Gms. CH <sub>3</sub> COOH per 100 Gms. Solution.	Solid Phase.	t°.	Gms. CH <sub>3</sub> COOH per 100 Gms. Solution.	Solid Phase.
-5	15.1	Ice	-20	66.3	CH <sub>3</sub> COOH
-10	28.2		-10	76.7	"
-15	39.5		-0	87.0	"
-20	49.5		+10	90.8	"
-25	57.0		16.5	100.0 tr. pt.	"
-26.6	58.9	Ice + CH <sub>3</sub> COOH			

## DISTRIBUTION OF ACETIC ACID BETWEEN:

### Water and Amyl Alcohol at 20°. (Herz and Fischer — Ber. 37, 4747, '04)

Gms. CH <sub>3</sub> COOH per 100 cc.		G. M. CH <sub>3</sub> COOH per 100 cc.	
H <sub>2</sub> O Layer.	Alcoholic Layer.	H <sub>2</sub> O Layer.	Alcoholic Layer.
1	0.923	0.01	0.0095
2	1.847	0.03	0.0280
3	2.741	0.05	0.0460
4	3.694	0.07	0.0645
5	4.587	0.09	0.0830
6	5.475	0.11	0.1010
7	6.434	0.13	0.1190
8	7.328	...	...

### Water and Benzene at 25°. (H. and F. — Ber. 38, 1140, '05.)

Gms. CH <sub>3</sub> COOH per 100 cc.		G. M. CH <sub>3</sub> COOH per 100 cc.	
H <sub>2</sub> O Layer.	C <sub>6</sub> H <sub>6</sub> Layer.	H <sub>2</sub> O Layer.	C <sub>6</sub> H <sub>6</sub> Layer.
5	0.130	0.05	0.0014
10	0.417	0.10	0.0005
20	1.55	0.20	0.0030
30	3.03	0.30	0.0290
40	4.95	0.50	0.051
..	...	0.70	0.090

## DISTRIBUTION OF ACETIC ACID BETWEEN WATER AND BENZENE.

(Waddell — J. Phys. Ch. 2, 237, 1898.)

Results in terms of grams per 100 grams solution.

t°.	Upper Layer.			Lower Layer.		
	CH <sub>3</sub> COOH.	C <sub>6</sub> H <sub>6</sub> .	H <sub>2</sub> O.	CH <sub>3</sub> COOH.	C <sub>6</sub> H <sub>6</sub> .	H <sub>2</sub> O.
25	0.46	99.52	0.02	9.4	0.18	90.42
25	3.10	96.75	0.15	28.2	0.53	71.27
25	5.20	94.55	0.25	37.7	0.84	61.46
25	8.7	90.88	0.42	48.3	1.82	49.88
25	16.3	82.91	0.79	61.4	6.1	32.5
25	30.5	67.37	2.13	66.0	13.8	20.2
25	52.5	39.60	7.60	52.8	39.6	7.6
35	1.2	98.68	0.08	16.4	0.62	89.98
35	5.7	93.97	0.33	36.8	1.42	62.78
35	9.0	90.42	0.58	49.0	2.10	48.90
35	45.0	49.00	6.0	61.3	25.5	13.2
35	52.2	39.4	8.4	52.2	39.4	8.4

## DISTRIBUTION OF ACETIC ACID BETWEEN WATER AND CHLOROFORM:

At Room Temperature.

(Wright, Thomson and Leon — Proc. Roy. Soc. 49, 185, 1891.)

At 25°.

(Hers and Lewy; Rothmund and Wilsmore.)

Results in parts per 100 parts of solution.						Gms. CH <sub>3</sub> COOH per 100 cc.		G. M. CH <sub>3</sub> COOH per 100 cc.	
Upper Layer.			Lower Layer.			H <sub>2</sub> O Layer.	CHCl <sub>3</sub> Layer.	H <sub>2</sub> O Layer.	CHCl <sub>3</sub> Layer.
CH <sub>3</sub> COOH.	CHCl <sub>3</sub> .	H <sub>2</sub> O.	CH <sub>3</sub> COOH.	CHCl <sub>3</sub> .	H <sub>2</sub> O.				
0	0.84	99.16	0	99.01	0.99	2	0.089	0.05	0.0032
6.46	0.92	92.62	1.04	98.24	0.72	4	0.313	0.075	0.0062
17.69	0.79	81.52	3.83	94.98	1.19	6	0.596	0.100	0.0100
25.10	1.21	73.69	6.77	91.85	1.38	8	0.974	0.150	0.0198
33.71	2.97	63.32	11.05	87.82	1.13	10	1.430	0.175	0.0260
44.12	7.30	48.58	17.72	80.00	2.28	12	1.982	0.200	0.0325
50.18	15.11	34.71	25.75	70.13	4.12	20	5.10	0.30	0.070
						30	10.2	0.50	0.170
						40	15.3	0.70	0.275
						50	21.9	0.80	0.335
						52.3	39.54	0.87	0.659

The figures in the table for 25° were read from the curve plotted from the results of H. and L., Z. electro. Ch. 11, 818, 1905, and of R. and W., Z. phys. Ch. 40, 623, 1902.

The influence of electrolytes upon the distribution of acetic acid between the aqueous and chloroform layers was investigated by Rothmund and Wilsmore, and the following results expressed in gram molecules per liter at 25° were obtained:

Electro-lyte.	Conc. of Electrolyte		Conc. of CH <sub>3</sub> COOH in		Conc.* CH <sub>3</sub> COOH	Electro-lyte.	Conc. of Electrolyte		Conc. of CH <sub>3</sub> COOH in		Conc.* CH <sub>3</sub> COOH
	Aq. Layer.	CHCl <sub>3</sub> Layer.	Aq. Layer.	CHCl <sub>3</sub> Layer.			Aq. Layer.	CHCl <sub>3</sub> Layer.	Aq. Layer.	CHCl <sub>3</sub> Layer.	
HCl	0.463	0.876	0.0907	0.946	½ H <sub>2</sub> SO <sub>4</sub>	0.514	1.099	0.1315	1.168		
"	0.463	1.538	0.2435	1.680		1.029	1.555	0.2714	1.787		
"	0.926	0.813	0.0938	0.966							
"	0.926	1.586	0.2902	1.858							
HNO <sub>3</sub>	0.316	0.936	0.0927	0.958	NH <sub>4</sub> NO <sub>3</sub>	1.0	1.136	0.1313	1.168		
"	0.316	1.694	0.2537	1.720	"	1.0	1.991	0.3481	2.053		
"	0.633	0.965	0.0981	0.988	LiNO <sub>3</sub>	1.0	0.892	0.1005	1.000		
"	0.633	1.631	0.2486	1.702	"	1.0	1.513	0.2581	1.737		

\* Calculated from table above.



# ACETIC ACID

4

## DISTRIBUTION OF ACETIC ACID AT 25° BETWEEN:

### Water and Carbon Bisulphide.

(Herz and Lewy.)

Gms. CH <sub>3</sub> COOH per 100 cc.		G. M. CH <sub>3</sub> COOH per 100 cc.	
H <sub>2</sub> O Layer.	CS <sub>2</sub> Layer.	H <sub>2</sub> O Layer.	CS <sub>2</sub> Layer.
65	2.64	1.1	0.45
70	3.0	1.2	0.55
75	3.3	1.2	0.80
80	5.4	1.35	0.97
85	6.4	1.4	1.3

### Water and Carbon Tetrachloride.

(Herz and Lewy.)

Gms. CH <sub>3</sub> COOH per 100 cc.		G. M. CH <sub>3</sub> COOH per 100 cc.	
H <sub>2</sub> O Layer.	CCl <sub>4</sub> Layer.	H <sub>2</sub> O Layer.	CCl <sub>4</sub> Layer.
30	1.8	0.5	0.03
40	3.0	0.7	0.055
50	4.8	0.9	0.095
60	5.8	1.1	0.155
70	12.0	1.2	0.235
76.2	25.2	1.27	0.420

## DISTRIBUTION OF ACETIC ACID AT 25° BETWEEN:

### Water and Bromoform.

(H. and L. — Z. electro. Ch. 11, 818, '05.)

Gms. CH <sub>3</sub> COOH per 100 cc.		G. M. CH <sub>3</sub> COOH per 100 cc.	
H <sub>2</sub> O Layer.	CHBr <sub>3</sub> Layer.	H <sub>2</sub> O Layer.	CHBr <sub>3</sub> Layer.
20	1.5	0.4	0.035
30	3.0	0.6	0.070
40	4.8	0.8	0.120
50	7.8	1.0	0.20
60	12.0	1.1	0.28
65	15.6	1.15	0.395
70	27.0	...	...

### Water and Toluene.

(H. and F. — Ber. 38, 1140, '05.)

Gms. CH <sub>3</sub> COOH per 100 cc.		G. M. CH <sub>3</sub> COOH per 100 cc.	
H <sub>2</sub> O Layer.	C <sub>6</sub> H <sub>5</sub> CH <sub>3</sub> Layer.	H <sub>2</sub> O Layer.	C <sub>6</sub> H <sub>5</sub> CH <sub>3</sub> Layer.
5	0.119	0.1	0.0025
10	0.328	0.2	0.0075
20	1.132	0.4	0.0260
30	2.265	0.6	0.0530
40	3.725	0.8	0.090
50	5.841	1.0	0.140
60	8.344	...	...

## DISTRIBUTION OF ACETIC ACID AT 25° BETWEEN:

### Water and *o* or *p* Xylene.

(Herz and Fischer.)

Gms. CH <sub>3</sub> COOH per 100 cc.		G. M. CH <sub>3</sub> COOH per 100 cc.	
H <sub>2</sub> O Layer.	<i>o</i> or <i>p</i> Xylene Layer.	H <sub>2</sub> O Layer.	<i>o</i> or <i>p</i> Xylene Layer.
5	0.24	0.1	0.004
10	0.48	0.2	0.010
20	1.13	0.4	0.025
30	2.15	0.6	0.047
40	3.40	0.8	0.079
50	5.10	1.0	0.122
60	7.27	1.2	0.230
70	12.52	...	...

### Water and *m* Xylene.

(Herz and Fischer.)

Gms. CH <sub>3</sub> COOH per 100 cc.		G. M. CH <sub>3</sub> COOH per 100 cc.	
H <sub>2</sub> O Layer.	<i>m</i> Xylene Layer.	H <sub>2</sub> O Layer.	<i>m</i> Xylene Layer.
5	0.06	0.1	0.0015
10	0.30	0.2	0.007
20	0.95	0.4	0.022
30	1.91	0.6	0.042
40	3.04	0.8	0.072
50	4.65	1.0	0.111
60	6.65	1.2	...

NOTE. — The distribution results as presented in the original papers to which references are given in the above tables, are reported in millimoles per 10 cc. portions of each layer in the several cases. To obtain the figures given in the above tables, the original results before and after calculating to gram quantities were plotted on cross-section paper, and from the curves thus obtained, readings for regular intervals of concentration of acetic acid in the aqueous layer were selected.

Chlor ACETIC ACID  $\text{CH}_3\text{ClCOOH}$ .

## DISTRIBUTION OF CHLORACETIC ACID BETWEEN:

(Herz and Fischer.)

Water and Benzene at 25°.				Water and Toluene at 25°.			
Gms. $\text{CH}_3\text{ClCOOH}$ per 100 cc.		G. M. $\text{CH}_3\text{ClCOOH}$ per 100 cc.		Gms. $\text{CH}_3\text{ClCOOH}$ per 100 cc.		G. M. $\text{CH}_3\text{ClCOOH}$ per 100 cc.	
$\text{H}_2\text{O}$ Layer.	$\text{C}_6\text{H}_6$ Layer.	$\text{H}_2\text{O}$ Layer.	$\text{C}_6\text{H}_6$ Layer.	$\text{H}_2\text{O}$ Layer.	$\text{C}_6\text{H}_5\text{CH}_3$ Layer.	$\text{H}_2\text{O}$ Layer.	$\text{C}_6\text{H}_5\text{CH}_3$ Layer.
0.25*	8.69	0.0025	0.090	0.1*	5.22	0.001	0.055
0.5	15.59	0.005	0.155	0.5	20.31	0.005	0.20
1.0	27.87	0.010	0.28	1.0	34.87	0.010	0.36
1.5	41.10	0.015	0.415	1.5	49.14	0.015	0.50
2.0	52.90	0.02	0.54	2.0	60.46	0.02	0.62
3.0	68.01	0.03	0.70	3.0	72.28	0.03	0.77
4.0	76.52	0.04	0.79	4.0	81.72	0.04	0.85
				5.0	86.94	0.05	0.90

## DISTRIBUTION OF CHLORACETIC ACID BETWEEN:

(Herz and Lewy.)

Water and Chloroform at 25°.				Water and Bromoform at 25°.			
Gms. $\text{CH}_3\text{ClCOOH}$ per 100 cc.		G. M. $\text{CH}_3\text{ClCOOH}$ per 100 cc.		Gms. $\text{CH}_3\text{ClCOOH}$ per 100 cc.		G. M. $\text{CH}_3\text{ClCOOH}$ per 100 cc.	
$\text{H}_2\text{O}$ Layer.	$\text{CHCl}_3$ Layer.	$\text{H}_2\text{O}$ Layer.	$\text{CHCl}_3$ Layer.	$\text{H}_2\text{O}$ Layer.	$\text{CHBr}_3$ Layer.	$\text{H}_2\text{O}$ Layer.	$\text{CHBr}_3$ Layer.
5*	0.283	0.05	0.0025	40*	0.850	0.45	0.011
10	0.614	0.10	0.0060	50	1.889	0.50	0.0165
20	1.088	0.20	0.0135	60	2.994	0.60	0.028
40	2.948	0.40	0.029	70	4.241	0.70	0.040
50	3.684	0.60	0.045	80	5.620	0.80	0.053
60	4.440	0.70	0.061	90	7.560	0.90	0.067
70	7.086	0.75	0.077	91.6	11.340	0.97	0.120

## DISTRIBUTION OF CHLORACETIC ACID BETWEEN:

(Herz and Lewy.)

Water and Carbon Bisulphide at 25°.				Water and Carbon Tetra- chloride at 25°.			
Gms. $\text{CH}_3\text{ClCOOH}$ per 100 cc.		G. M. $\text{CH}_3\text{ClCOOH}$ per 100 cc.		Gms. $\text{CH}_3\text{ClCOOH}$ per 100 cc.		G. M. $\text{CH}_3\text{ClCOOH}$ per 100 cc.	
$\text{H}_2\text{O}$ Layer.	$\text{CS}_2$ Layer.	$\text{H}_2\text{O}$ Layer.	$\text{CS}_2$ Layer.	$\text{H}_2\text{O}$ Layer.	$\text{CCl}_4$ Layer.	$\text{H}_2\text{O}$ Layer.	$\text{CCl}_4$ Layer.
60*	0.426	0.6	0.0042	90*	1.417	0.95	0.0150
80	0.691	0.8	0.007	95	2.031	1.00	0.0195
90	0.803	1.0	0.009	100	2.645	1.05	0.0270
100	1.040	1.05	0.0105	105	4.26	1.10	0.0415
105	1.464	1.10	0.015	106.7	5.19	1.13	0.0550
106.7	1.890	1.13	0.020				

\* See Note, page 4.

**SOLUBILITY OF MONOCHLOR, DICHLOR, AND OF TRICHLORACETIC ESTER  
IN AQUEOUS ALCOHOL AT ROOM TEMPERATURE.**

(Bancroft — Phys. Rev. 3, 193, 1895-96, from results of Pfeiffer, Z. physik. chem. 9, 469, '92.)

cc. Ethyl Alcohol in Mixtures.	cc. H <sub>2</sub> O added to cause separation of a second phase in mixtures of the given amts. of Alcohol and 3 cc. of :		
	CH <sub>2</sub> ClCOOC <sub>2</sub> H <sub>5</sub> .	CHCl <sub>2</sub> COOC <sub>2</sub> H <sub>5</sub> .	CCl <sub>3</sub> COOC <sub>2</sub> H <sub>5</sub> .
3	1.32	0.90	0.65
6	4.01	2.45	1.80
9	7.30	4.33	3.02
12	10.78	6.60	4.50
15	16.16	9.20	6.50
18	22.16	...	...
21	28.74	...	...

**α ACETNAPHTHALIDE** C<sub>7</sub>H<sub>5</sub>ONH(C<sub>10</sub>H<sub>7</sub>).

**SOLUBILITY IN MIXTURES OF ALCOHOL AND WATER AT 25°.**

(Holleman and Antusch — Rec. trav. chim. 13, 289, 1894.)

Vol. % Alcohol.	Gms. per 100 Gms. Solvent.	Sp. Gr. of Solutions.	Vol. % Alcohol.	Gms. per 100 Gms. Solvent.	Sp. Gr. of Solutions.
100	4.02	0.7916	65	1.78	0.8977
95	4.31	0.8150	60	1.44	0.9091
90	4.11	0.8344	55	1.02	0.9201
85	3.69	0.8485	50	0.71	0.9290
80	3.18	0.8624	35	0.25	0.9537
75	2.73	0.8761	20	0.09	0.9717
70	2.31	0.8798	10	0.04	0.9841

**ACETONE** (CH<sub>3</sub>)<sub>2</sub>CO.

**SOLUBILITY OF ACETONE AT 25° IN AQUEOUS SOLUTIONS OF:**

**Electrolytes.**

**Non-Electrolytes.**

(Bell — J. Phys. Ch. 9, 544, 1905; Linebarger — Am. Ch. J. 14, 380, 1892.)

Gms. Electro- lyte per 100 Gms. Aq. Solution.	Gms. (CH <sub>3</sub> ) <sub>2</sub> CO per 100 Gms. Solvent in Solutions of:				Gms. Non- Electrolyte per 100 Gms. Aq. Solution.	Gms. (CH <sub>3</sub> ) <sub>2</sub> CO per 100 Gms. Solvent in Solutions of:		
	K <sub>2</sub> CO <sub>3</sub>	Na <sub>2</sub> CO <sub>3</sub>	(NH <sub>4</sub> ) <sub>2</sub> CO <sub>3</sub>	MgCO <sub>3</sub>		C <sub>10</sub> H <sub>8</sub> * Anethol.*	(C <sub>6</sub> H <sub>5</sub> ) <sub>2</sub> CO.	
1.25	...	...	...	83.5	5	92.5	103.0	90.0
2.50	...	51.0	110.0	65.0	10	117.0	123.0	108.5
5.00	65.0	38.0	73.5	47.0	20	137.0	144.5	126.0
7.5	46.5	27.5	57.0	38.0	30	148.5	155.0	133.0
10.0	34.5	19.5	44.5	29.0	40	155.5	162.0	136.0
12.5	25.5	14.0	35.0	...	50	159.5	166.0	135.5
15.0	18.0	9.0	28.0	...	60	160.2	165.0	131.5
20.0	8.0	2.7	...	...	70	155.0	158.0	123.0
25.0	3.7	...	...	...	80	...	...	108.5
30.0	1.6	...	...	...	90	...	...	82.0

\* Anethol = *p* Propenylanisol CH<sub>3</sub>.CH:CH(C<sub>6</sub>H<sub>4</sub>OCH<sub>3</sub>). Naphthalene results at 35°.

NOTE. — The original results were recalculated and plotted on cross-section paper. From the curves so obtained the above table was constructed. See also Note, page 7.

## SOLUBILITY OF ACETONE IN AQUEOUS SOLUTIONS OF CARBOHYDRATES.

(Krug and McElroy — J. Anal. Ch. 6, 184, '92; Bell — J. Phys. Ch. 9, 547, '05.)

## In Aqueous Solutions of Cane Sugar.

Per cent Sugar.	Gms. (CH <sub>3</sub> ) <sub>2</sub> CO per 100 Gms. Sugar Solution at:					
	15°.	20°.	25°.	30°.	35°.	40°.
10	597.2	...	581.8	...	574.8	...
20	272.5	...	250.0	...	251.8	...
30	172.4	...	150.0	...	150.6	...
35	...	...	...	...	...	110
40	...	96.4	92.8	89.8	...	85
45	...	71.9	68.8	65.7	...	62
50	...	50.8	48.1	45.9	...	42
55	...	35.8	33.8	32.5	...	29
60	...	25.2	24.2	23.4	...	...
65	...	18.3	17.7	17.0	...	...
70	...	13.2	12.8	12.5	...	...

## In Aqueous Dextrose Solutions.

## In Aqueous Maltose Solutions.

Per cent Dextrose.	Gms. (CH <sub>3</sub> ) <sub>2</sub> CO per 100 Gms. Solvent at:			Per cent Maltose.	Gms. (CH <sub>3</sub> ) <sub>2</sub> CO per 100 Gms. Solvent at:		
	15°.	25°.	35°.		15°.	25°.	35°.
10	736.7	747.9	761.5	10	353.6	348.1	342.0
20	255.3	247.7	240.8	20	185.4	181.2	176.9
30	157.5	149.8	142.5	30	119.9	116.0	112.4
40	86.9	79.6	74.0	40	78.4	74.7	70.5
50	36.2	33.0	31.2	50	46.2	42.9	39.8

NOTE. — The above determinations were made by adding successive small quantities of acetone to mixtures of known amounts of water and the carbohydrate, and noting the point at which a clouding due to the separation of a second phase occurred. This method was also used for the solubility of acetone in the aqueous electrolyte solutions (see previous page). In the case of the aqueous non-electrolyte solutions, however, successive small amounts of water were added to mixtures of known amounts of acetone and the non-electrolyte.

## DISTRIBUTION OF ACETONE BETWEEN WATER AND BENZENE AT 25°.

(Herz and Fischer — Ber. 38, 1142, '05.)

Gms. (CH <sub>3</sub> ) <sub>2</sub> CO per 100 cc.		G. M. (CH <sub>3</sub> ) <sub>2</sub> CO per 100 cc.	
Aq. Layer.	C <sub>6</sub> H <sub>6</sub> Layer.	Aq. Layer.	C <sub>6</sub> H <sub>6</sub> Layer.
1*	1.20	0.025*	0.025
5	4.17	0.05	0.047
10	10.15	0.10	0.075
15	15.59	0.15	0.150
20	22.50	0.20	0.215
		0.25	0.275

\* See Note, page 4.

**ACET-PHENETIDINE**

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**ACET-PHENETIDINE *p* (PHENACETINE)  $C_9H_9(OC_2H_5)NHCH_3CO$ .****SOLUBILITY IN WATER, ALCOHOL, ETC.**

(U. S. P.)

t°.	Gms. $C_9H_9(OC_2H_5)NHCH_3CO$ per 100 Gms.			
	H <sub>2</sub> O.	C <sub>2</sub> H <sub>5</sub> OH.	(CH <sub>3</sub> ) <sub>2</sub> O.	CHCl <sub>3</sub> .
25	0.108	8.33	1.59	5.00
b. pt.	1.43	50.0	...	...

**ACET-TOLUIDE *p*  $CH_3C_6H_4NH.C_2H_5O$ .****SOLUBILITY IN MIXTURES OF ALCOHOL AND WATER AT 25°.**

(Holleman and Antusch — Rec. trav. chim. 13, 288, '94.)

Vol. % Alcohol.	Gms. per 100 Gms. Solvent.	Sp. Gr. of Solutions.	Vol. % Alcohol.	Gms. per 100 Gms. Solvent.	Sp. Gr. of Solutions.
100	10.18	0.8074	50	1.92	0.9306
95	10.79	0.8276	45	1.41	0.9380
90	10.62	0.8440	40	0.96	0.9460
85	9.62	0.8576	35	0.66	0.9544
80	8.43	0.8685	25	0.31	0.9668
75	7.04	0.8803	20	0.23	0.9725
70	5.81	0.8904	15	0.16	0.9780
65	4.39	0.9021	5	0.13	0.9903
60	3.59	0.9115	0	0.12	0.9979
55	2.69	0.9207			

**ACETYLENE  $C_2H_2$ .****SOLUBILITY IN WATER.**

(Winkler; see Landolt and Börnstein's Tabellen, 3d ed. p. 604, '05.)

t°.	a.	q.
0	1.73	0.20
5	1.49	0.17
10	1.31	0.15
15	1.15	0.13
20	1.03	0.12
25	0.93	0.11
30	0.84	0.09

a, "Absorption Coefficient," = the volume of gas (reduced to 0° and 760 mm. pressure) taken up by one volume of the liquid at the given temperature when the partial pressure of the gas equals 760 mm. mercury.

q, "Solubility," = the amount of gas in grams which is taken up by 100 grams of the pure solvent at the given temperature if the total pressure, i.e., the partial pressure of the gas plus the vapor pressure of the liquid at the absorption temperature is 760 mm.

**ACETYLACETONE**  $\text{CH}_3\text{COCH}_2\text{COCH}_3$ .**SOLUBILITY IN WATER.**

(Rothmund — Z. phys. Ch. 26, 475, '98.)

t°.	Gms. $\text{CH}_3\text{COCH}_2\text{COCH}_3$ per 100 Gms.	
	H <sub>2</sub> O Layer.	Acetyl Acetone Layer.
30	15.46	95.02
40	17.58	93.68
50	20.22	91.90
60	23.23	89.41
70	27.10	85.77
80	33.92	78.82
87.7 (crit. temp.)	56.8	

NOTE. — Weighed amounts of water and acetylacetone were placed in small glass tubes, which were then sealed and slowly heated until the contained mixtures became homogeneous. The temperature was then allowed to fall very gradually and the point noted at which cloudiness appeared. This point was accurately established for each tube by repeated trials. The curve plotted from these determinations shows two percentage amounts of acetylacetone which cause cloudiness at each temperature below the critical point. Of these two points, for each temperature, one represents the aqueous layer, *i.e.*, the solubility of acetylacetone in water; and the other represents the acetylacetone layer, *i.e.*, the solubility of water in acetylacetone. This method is known as the "Synthetic Method," and yields results in harmony with those obtained by the analytical method, *i.e.*, by analyzing each layer after complete separation occurs.

**ACONITINE** (Amorphous)  $\text{C}_{24}\text{H}_{47}\text{NO}_{11}$ .**SOLUBILITY IN SEVERAL SOLVENTS.**

(At 25° U.S.P.; at 18°–22°, Müller — Apoth.-Ztg. 18, 2, '03.)

Solvent.	Gms. $\text{C}_{24}\text{H}_{47}\text{NO}_{11}$ per 100 Gms. Solvent at:		Solvent.	Gms. $\text{C}_{24}\text{H}_{47}\text{NO}_{11}$ per 100 Gms. Solvent at:	
	18°–22°.	25°.		18°–22°.	25°.
Water . . .	0.054	0.031	Benzene . . . . .	17.85	
Alcohol . . .		4.54	Carbon Tetrachloride	1.99	...
Ether . . .	1.44	2.27	Petroleum Ether . .	0.023	0.028

**ADIPIIC ACID** (Normal)  $(\text{CH}_2)_4(\text{COOH})_2$ .100 grams  $\text{H}_2\text{O}$  dissolve 1.44 grams adipic acid at 15°.(Henry — Compt. rend. 99, 1157, '84; Lamouroux — *Ibid.* 128, 998, '99.)

**AIR.**

10

**AIR**

# SOLUBILITY IN WATER.

(Winkler — Ber. 34, 1409, '01; see also Peterson and Sondern — Ber. 22, 1439, '89.)

t°.	B.	B'.	cc.* of atmospheric O and N per liter of: Dist. H <sub>2</sub> O (at 760 mm.).		Sea Water (at 760 mm.).	
			Oxygen.	Nitrogen.	Oxygen.	Nitrogen.
0	0.02881	0.02864	10.19	18.45	7.77	14.85
5	.02543	.02521	8.91	16.30	6.93	13.32
10	.02264	.02237	7.87	14.50	6.29	12.06
15	.02045	.02011	7.04	13.07	5.70	11.05
20	.01869	.01826	6.35	11.91	...	10.25
25	.01724	.01671	5.75	10.96	...	9.62
30	.01606	.01539	5.24	10.15		
40	.01418	.01315	4.48	8.67		
50	.01297	.01140	3.85	7.55		
60	.01216	.00978	3.25	6.50		
80	.01126	.00600	1.97	4.03		
100	.01105	.00000	0.00	0.00		

B = "Coefficient of Absorption," *i.e.*, the amount of gas dissolved by the liquid when the pressure of the gas itself without the tension of the liquid amounts to 760 mm.

B' = "Solubility," *i.e.*, the amount of gas, reduced to 0° and 760 mm., which is absorbed by one volume of the liquid when the barometer indicates 760 mm. pressure.

\* Reduced to 0° and 760 mm.

## SOLUBILITY OF AIR IN AQUEOUS SULPHURIC ACID AT 18° AND 760 MM.

(Tower — Z. anorg. Ch. 50, 382, '06.)

Wt. % H <sub>2</sub> SO <sub>4</sub>	98	90	80	70	60	50
Solubility Coef.	0.0173	0.0107	0.0069	0.0055	0.0059	0.0076

## SOLUBILITY OF AIR IN ALCOHOL, ETC.

(Robinet — Compt. rend. 58, 608, '64.)

Solvent.	Vols. Air per 100 Vols. Solvent.	Solvent.	Vols. Air per 100 Vols. Solvent.
Alcohol (95.1%)	14.1	Oil of Lavender.	6.9
Petroleum	6.8	Oil of Turpentine	24.2
Benzene	14.0		

## ALANINE (α Aminopropionic Acid) CH<sub>3</sub>CH(NH<sub>2</sub>)COOH.

### SOLUBILITY IN MIXTURES OF ALCOHOL AND WATER AT 25°.

(Holleman and Antusch — Rec. trav. chim. 13, 297, '94.)

Vol. % Alcohol.	Gms. per 100 Gms. Solvent.	Sp. Gr. of Solutions.	Vol. % Alcohol.	Gms. per 100 Gms. Solvent.	Sp. Gr. of Solutions.
0	16.47	1.0421	35	4.91	0.9670
5	14.37	1.0311	40	3.89	0.9577
10	12.43	1.0200	50	2.38	0.9355
15	10.49	1.0101	60	1.57	0.9102
20	8.48	0.9984	70	0.85	0.8836
25	7.11	0.9886	80	0.37	0.8556
31	5.53	0.9761			

**ALDEHYDE.****SOLUBILITY OF *p* FORMALDEHYDE (TRIOXYMETHYLENE) IN AQUEOUS SODIUM SULPHITE SOLUTIONS AT 20°.**

(Lumière and Seyewetz — Bull. soc. chim. [3] 27, 1213, '02.)

Grams Sodium Sulphite per 100 cc. H <sub>2</sub> O	5	10	20	28
Gms. Trioxymethylene per 100 cc. solution	22	24	26	27

100 gms. H<sub>2</sub>O dissolve 12.5 paraldehyde at 25°, and 6.6 gms. at b. pt.**ALCOHOLS.****SOLUBILITY OF AMYL ALCOHOL IN WATER AT 22°.**

(Herz — Ber. 31, 2671, '98.)

100 cc. water dissolve 3.284 cc. amyl alcohol. Sp. Gr. of solution = 0.9949, Volume = 102.99 cc.

100 cc. amyl alcohol dissolve 2.214 cc. water. Sp. Gr. of solution = 0.8248, Volume = 101.28 cc.

Sp. Gr. of H<sub>2</sub>O at 22° = 0.9980; Sp. Gr. of amyl alcohol at 22° = 0.8133.**SOLUBILITY OF AMYL ALCOHOL IN WATER AT DIFFERENT TEMPERATURES, "SYNTHETIC METHOD" (see Note, page 9).**

(Alexejew — Ann. phys. Chem. 28, 305, '86.)

t°.	Gms. C <sub>5</sub> H <sub>11</sub> OH per 100 Gms.		t°.	Gms. C <sub>5</sub> H <sub>11</sub> OH per 100 Gms.	
	Aqueous Layer.	Alcoholic Layer.		Aqueous Layer.	Alcoholic Layer.
0	8	97	100	2.0	80
20	6	94	120	4.0	77
40	4	90	140	7.0	73
60	2	87	150	9.0	72
80	1.5	83			

**SOLUBILITY OF AMYL ALCOHOL IN AQ. ETHYL ALCOHOL SOLUTIONS.**

(Bancroft — Phys. Rev. 3, 193, '95-96.)

cc. Ethyl Alcohol in Mixture.	cc. H <sub>2</sub> O added to cause Separation of a Second Phase in Mixtures of the given Amounts of Ethyl Alcohol and 3 cc. Portions of Amyl Alcohol at:	
	9.1°.	19.2°.
3	13.21	3.50
6	10.35	10.80
9	18.34	19.10
12	27.47	29.15
15	41.25	43.15

NOTE. — The effect of various amounts of a large number of salts upon the temperature (39.8°) at which a mixture of 20 cc. of amyl alcohol + 20 cc. of ethyl alcohol + 32.9 cc. of water becomes homogeneous has been investigated by Pfeiffer (Z. phys. Ch. 9, 444, '92). The results are no doubt of interest from a solubility standpoint, but their recalculation to terms suitable for presentation in the present compilation has not been attempted.

**SOLUBILITY OF ISOAMYL ALCOHOL IN WATER.**

t°.	Gms. Iso Amyl Alcohol per 100 Gms.	
	H <sub>2</sub> O Layer.	Alcoholic Layer.
13.7	2.0	...
16.5	2.5	92.9
22	2.61	97.36

Observer.

Balbrano — Ber. 9, 1437, '76  
 Wittstein — Jahrb. 408, '62  
 Herz — Ber. 31, 2669, '98



# ALCOHOLS.

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## SOLUBILITY OF BUTYL ALCOHOLS IN WATER, "SYNTHETIC METHOD"

(see Note, page 9).

(Alexejew — Ann. phys. Chem. 28, 305, '86.)

Secondary Butyl Alcohol and Water.			Iso Butyl Alcohol and Water.		
Gms. Secondary Butyl Alcohol per 100 Gms.			Gms. Iso Butyl Alcohol per 100 Gms.		
t°.	Aqueous Layer.	Alcoholic Layer.	Aqueous Layer.	Alcoholic Layer.	
-20	27	66	...	...	
-10	28	60	...	...	
0	27.5	56	13	85	
10	26.0	57	...	...	
20	22.5	60	9	84	
30	18	63.5	...	...	
40	16	65.5	7.5	83	
60	13	67	7	82	
80	15	63	7	77.5	
100	20	52	8	72	
107 crit. temp.	33		...	...	
120			16	62	
130			28	50	
133 crit. temp.			40		

## DISTRIBUTION OF ETHYL ALCOHOL BETWEEN WATER AND BENZENE

AT 25°.

(Taylor — J. Phys. Ch. 1, 468, '97.)

Composition of 10 cc. of Upper Layer.			Composition of 10 cc. Lower Layer.		
C <sub>2</sub> H <sub>6</sub> .	H <sub>2</sub> O.	C <sub>2</sub> H <sub>5</sub> OH.	C <sub>2</sub> H <sub>6</sub> .	H <sub>2</sub> O.	C <sub>2</sub> H <sub>5</sub> OH.
5.92	0.60	3.48	4.37	1.07	4.56
6.43	0.48	3.09	3.54	1.41	5.05
7.40	0.29	2.31	2.04	2.27	5.69
8.13	0.17	1.70	1.08	3.22	8.70
8.65	0.10	1.25	0.59	4.06	5.35
9.05	0.06	0.89	0.28	4.99	4.73

## ALUMINIUM CHLORIDE AlCl<sub>3</sub> · 6 H<sub>2</sub>O.

### SOLUBILITY IN WATER.

(Gerlach — Z. anal. Ch. 8, 250, '69.)

100 gms. saturated solution contain 41.13 gms. AlCl<sub>3</sub> at 15°, Sp. Gr. of solution = 1.354.

## ALUMINIUM SULPHATE Al<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub> · 18 H<sub>2</sub>O.

### SOLUBILITY IN WATER.

(Poggiale — Ann. chim. phys. [3] 8, 467, '43.)

Gms. Al <sub>2</sub> (SO <sub>4</sub> ) <sub>3</sub> per 100 Gms.			Gms. Al <sub>2</sub> (SO <sub>4</sub> ) <sub>3</sub> per 100 Gms.		
t°.	Water.	Solution.	t°.	Water.	Solution.
0	31.3	23.8	60	59.1	37.2
10	33.5	25.1	70	66.2	39.8
20	36.1	26.7	80	73.1	42.2
30	40.4	28.8	90	80.8	44.7
40	45.7	31.4	100	89.1	47.1
50	52.1	34.3			

100 gms. of a saturated solution of aluminium sulphate in glycol contain 14.4 gms. Al<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub>.

(de Coninck — Bull. acad. roy. Belgique, 359, '05.)

## ALUMS.

SOLUBILITY OF AMMONIUM ALUM AND OF POTASSIUM ALUM  
IN WATER.

(Mulder; Poggiale — Ann. chim. phys. [3] 8, 467, '43; Locke — Am. Ch. J. 26, 174, '01; Marino — Gazz. chim. ital. 35, II, 351, '05; Berkeley — Trans. Roy. Soc. 203 A, 214, '04.)

t°.	Ammonium Alum.			Potassium Alum.		
	Gms. (NH <sub>4</sub> ) <sub>2</sub> Al <sub>2</sub> (SO <sub>4</sub> ) <sub>3</sub> per 100 g. H <sub>2</sub> O.	Gms. (NH <sub>4</sub> ) <sub>2</sub> Al <sub>2</sub> (SO <sub>4</sub> ) <sub>3</sub> ·24H <sub>2</sub> O per 100 g. H <sub>2</sub> O.	G.M. (NH <sub>4</sub> ) <sub>2</sub> Al <sub>2</sub> (SO <sub>4</sub> ) <sub>3</sub> per 100 g. H <sub>2</sub> O.	Gms. K <sub>2</sub> Al <sub>2</sub> (SO <sub>4</sub> ) <sub>3</sub> per 100 g. H <sub>2</sub> O.	Gms. K <sub>2</sub> Al <sub>2</sub> (SO <sub>4</sub> ) <sub>3</sub> ·24H <sub>2</sub> O per 100 g. H <sub>2</sub> O.	G. M. K <sub>2</sub> Al <sub>2</sub> (SO <sub>4</sub> ) <sub>3</sub> per 100 g. H <sub>2</sub> O.
0	2.10	3.90	0.0044	3.0	5.65	0.0058
5	3.50	6.91	0.0074	3.5	6.62	0.0068
10	4.99	9.52	0.0105	4.0	7.60	0.0077
15	6.25	12.66	0.0132	5.0	9.59	0.0097
20	7.74	15.13	0.0163	5.9	11.40	0.0114
25	9.19	19.19	0.0194	7.23	14.14	0.0140
30	10.94	22.01	0.0231	8.39	16.58	0.0162
40	14.88	30.92	0.0314	11.70	23.83	0.0227
50	20.10	44.10	0.0424	17.00	36.40	0.0329
60	26.70	66.65	0.0569	24.75	57.35	0.0479
70	...	...	...	40.0	110.5	0.0774
80	...	...	...	71.0	321.3	0.1374
90	...	...	...	109.0	2275.0	0.2110
92.5	...	...	...	119.0	∞	0.2313
95	109.7	∞	0.2312	...	...	...

NOTE. — The potassium alum figures in the preceding table were taken from a curve plotted from the closely agreeing determinations of Mulder, Locke, Berkeley, and Marino. For the higher temperatures (above 60°), however, the results of Marino are lower than those of the other investigators, and are omitted from the average curve.

Locke called attention in his paper to the fact that Poggiale's results upon ammonium and potassium alum had evidently become interchanged through some mistake. This explanation is entirely substantiated, not only by Locke's determinations, but also by those of Mulder and Berkeley. The ammonium alum figures given above were therefore read from Poggiale's potassium alum curve, with which Locke's determination of the solubility of ammonium alum at 25° is in entire harmony.

## SOLUBILITY OF AMMONIUM ALUM IN PRESENCE OF AMMONIUM SULPHATE AND IN PRESENCE OF ALUMINIUM SULPHATE IN WATER.

(Rüdorff — Ber. 18, 1160, '85.)

Mixture Used.	100 Gms. Saturated Solution Contain:	
	Grams (NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub> +	Grams Al <sub>2</sub> (SO <sub>4</sub> ) <sub>3</sub>
Saturated Ammonium Alum at 18.5° . . . . .	1.42	3.69
20 cc. above sol. + 6 gms. cryst. Al <sub>2</sub> (SO <sub>4</sub> ) <sub>3</sub> . . .	0.45	16.09
20 cc. above sol. + 4 gms. cryst. (NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub> . .	20.81	0.29

## ALUMS

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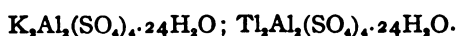
## SOLUBILITY OF MIXTURES OF POTASSIUM ALUM AND ALUMINIUM SULPHATE AND OF POTASSIUM ALUM AND POTASSIUM SULPHATE IN WATER.

(Marino — Gazz. chim. ital. 35, II, 351, '05.)

t°.	Gms. per 1000 Gms. H <sub>2</sub> O.		Gm. Mols. per 1000 Mols. H <sub>2</sub> O.		Solid Phase.
	Al <sub>2</sub> (SO <sub>4</sub> ) <sub>3</sub> ·18H <sub>2</sub> O.	K <sub>2</sub> SO <sub>4</sub> .	Al <sub>2</sub> (SO <sub>4</sub> ) <sub>3</sub> ·18H <sub>2</sub> O.	K <sub>2</sub> SO <sub>4</sub> .	
0	243.73	23.45	6.1	2.3	K <sub>2</sub> Al <sub>2</sub> (SO <sub>4</sub> ) <sub>3</sub> ·24H <sub>2</sub> O
20	824.25	30.85	15.1	3.1	+ Al <sub>2</sub> (SO <sub>4</sub> ) <sub>3</sub>
35	911.02	35.29	24.1	3.6	"
50	1243.21	59.55	33.5	6.1	"
65	1598.00	119.43	43.1	12.6	"
77	1872.11	183.80	50.5	18.9	"
0	5.06	75.83	0.1	7.8	K <sub>2</sub> Al <sub>2</sub> (SO <sub>4</sub> ) <sub>3</sub> ·24H <sub>2</sub> O
0.5	8.66	75.18	0.2	7.7	+ K <sub>2</sub> SO <sub>4</sub>
5.	16.07	85.78	0.4	8.8	"
10	18.52	96.50	0.5	9.9	"
15	20.56	109.30	0.55	11.2	"
30	39.60	147.8	1.0	15.2	"
40	73.88	163.1	1.9	16.8	"
50	126.0	195.4	3.4	20.1	"
60	249.7	238.8	6.7	24.6	"
70	529.0	323.7	14.2	32.6	"
80	1044.0	517.27	28.1	53.4	"

## SOLUBILITY OF MIXTURES OF POTASSIUM ALUM AND OF THALLIUM ALUM IN WATER AT 25°.

(Fock — Z. Kryst. Min. 28, 397, '97.)



Composition of Solution.					Sp. Gr. of Solutions.	Solid Phase Mol. % of Potassium Alum.
KAl(SO <sub>4</sub> ) <sub>2</sub> per Liter.		TlAl(SO <sub>4</sub> ) <sub>2</sub> per Liter.		Mol. % KAl(SO <sub>4</sub> ) <sub>2</sub> .		
Grams.	Mg. Mols.	Grams.	Mg. Mols.			
69.90	270.5	0.00	0.00	100	1.0591	100.0
74.56	288.2	0.48	1.13	99.61	1.0601	99.32
67.90	262.8	1.72	4.07	98.48	1.0598	96.84
65.30	252.7	4.52	10.67	95.95	1.0603	90.84
64.95	251.4	9.60	22.67	91.73	1.0605	82.94
53.23	205.9	18.44	43.56	82.54	1.0609	68.24
45.32	175.4	24.60	58.10	75.12	1.0609	58.23
38.02	147.2	32.48	76.75	65.73	1.0611	46.72
34.54	133.6	35.59	84.10	61.36	1.0611	44.23
28.35	109.7	42.99	101.60	51.93	1.0623	32.07
10.94	42.4	66.12	156.2	21.34	1.0654	7.94
0.00	0.0	75.46	178.3	0.00	1.0674	0.00

## SOLUBILITY OF SODIUM ALUM IN WATER.

100 gms. H<sub>2</sub>O dissolve 51.0 gms. (?anhy.) Al<sub>2</sub>Na<sub>2</sub>(SO<sub>4</sub>)<sub>4</sub>.24H<sub>2</sub>O at 16°.  
(Auge — Compt. rend. 110, 1139, '90.)

100 gms. H<sub>2</sub>O dissolve 110.0 gms. Al<sub>2</sub>Na<sub>2</sub>(SO<sub>4</sub>)<sub>4</sub>.24H<sub>2</sub>O at 0°.  
(Tilden — J. Ch. Soc. (Lond.) 45, 269, '84.)

## SOLUBILITY OF CAESIUM ALUM, RUBIDIUM ALUM, AND OF THALLIUM ALUM IN WATER.

(Setterburg — Liebig's Annalen, 211, 104, '82; Locke — Am. Ch. J. 26, 183, '01; Berkeley — Trans. Roy. Soc. 203 A, 215, '04.)

t°.	Caesium Alum.		Rubidium Alum.		Thallium Alum.	
	Gms. per 100 Gms. H <sub>2</sub> O.		Gms. per 100 Gms. H <sub>2</sub> O.		Gms. per 100 Gms. H <sub>2</sub> O.	
	Al <sub>2</sub> Cs <sub>2</sub> (SO <sub>4</sub> ) <sub>4</sub>	Al <sub>2</sub> Cs <sub>2</sub> (SO <sub>4</sub> ) <sub>4</sub> .24H <sub>2</sub> O.	Al <sub>2</sub> Rb <sub>2</sub> (SO <sub>4</sub> ) <sub>4</sub>	Al <sub>2</sub> Rb <sub>2</sub> (SO <sub>4</sub> ) <sub>4</sub> .24H <sub>2</sub> O.	Al <sub>2</sub> Tl <sub>2</sub> (SO <sub>4</sub> ) <sub>4</sub>	Al <sub>2</sub> Tl <sub>2</sub> (SO <sub>4</sub> ) <sub>4</sub> .24H <sub>2</sub> O.
0	0.21	0.34	0.72	1.21	3.15	4.84
5	0.25	0.40	0.86	1.48	3.80	5.86
10	0.30	0.49	1.05	1.81	4.60	7.12
20	0.40	0.65	1.50	2.59	6.40	10.00
25	0.50	0.81	1.80	3.12	7.60	11.95
30	0.60	0.97	2.20	3.82	9.38	14.89
40	0.85	1.38	3.25	5.69	14.40	23.57
50	1.30	2.11	4.80	8.50	22.50	38.41
60	2.00	3.27	7.40	13.36	35.36	65.19
70	3.20	5.27	12.40	23.25	...	...
80	5.40	9.01	21.60	43.25	...	...
90	10.50	18.11	...	...	...	...
100	22.70	42.54	...	...	...	...

NOTE. — Curves were plotted from the closely agreeing determinations recorded by the above named investigators, and the table constructed from the curves.

## AMINES.

## METHYL AMINE AND TRI METHYL AMINE, DISTRIBUTION BETWEEN:

## Water and Amyl Alcohol.

(Herz and Fischer — Ber. 37, 4751, '04.)

Gms. NH <sub>2</sub> (CH <sub>3</sub> ) per 100 cc.		Millimols NH <sub>2</sub> (CH <sub>3</sub> ) per 10 cc.	
Aq. Layer.	Alcoholic Layer.	Aq. Layer.	Alcoholic Layer.
0.37	0.12	1.155	0.3804
0.94	0.33	3.036	1.070
1.57	0.54	5.054	1.759
1.89	0.69	6.083	2.219
2.00	0.72	6.429	2.315
2.53	0.92	8.126	2.981
3.30	1.24	10.613	3.974

## Water and Benzene.

(Herz and Fischer — Ber. 38, 1143, '05.)

Gms. N(CH <sub>3</sub> ) <sub>3</sub> per 100 cc.		Millimols N(CH <sub>3</sub> ) <sub>3</sub> per 10 cc.	
Aq. Layer.	C <sub>6</sub> H <sub>6</sub>	Aq. Layer.	C <sub>6</sub> H <sub>6</sub>
0.345	0.174	0.584	0.295
0.812	0.396	1.377	0.670
1.075	0.545	1.819	0.921
1.462	0.731	2.474	1.237
2.139	1.077	3.619	1.823
2.757	1.376	4.663	2.328
3.292	1.683	5.568	2.847
3.996	2.053	6.760	3.474
6.582	3.465	11.135	5.861

# AMINES

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## SOLUBILITIES OF DI ETHYL AMINE AND WATER.\*

(Lattay — Phil. Mag. [6] 10, 308, '05.)

t°.	Gms. $\text{NH}(\text{C}_2\text{H}_5)_2$ per 100 Gms.	
	Aqueous Layer.	Amine Layer.
155	21.7	59.0
150	23.6	55.5
148	24.8	53.5
146	26.3	51.0
145	28.0	49.0
144	31.0	45.0
143.5 (crit. t.)	37.4	

## DISTRIBUTION OF TRI ETHYL AMINE BETWEEN WATER AND AMYL ALCOHOL AT 25°.

(Herz and Fischer — Ber. 37, 4751, '04.)

Gms. $\text{N}(\text{C}_2\text{H}_5)_3$ per 100 cc.		Millimols $\text{N}(\text{C}_2\text{H}_5)_3$ per 10 cc.	
Aqueous Layer.	Alcoholic Layer.	Aqueous Layer.	Alcoholic Layer.
0.0885	2.299	0.0875	2.273
0.1683	4.457	0.1664	4.408
0.1866	4.922	0.1846	4.868
0.2502	6.491	0.2474	6.418

## Tri Ethyl AMINE $\text{N}(\text{C}_2\text{H}_5)_3$ .

### SOLUBILITY IN WATER.

(Rothmund — Z. phys. Ch. 26, 433, '08.)

t°.	Gms. $\text{N}(\text{C}_2\text{H}_5)_3$ per 100 Gms.		t°.	Gms. $\text{N}(\text{C}_2\text{H}_5)_3$ per 100 Gms.	
	Aq. Layer.	Amine Layer.		Aq. Layer.	Amine Layer.
18.6 (crit. temp.)		51.9	40	3.65	96.48
20	14.24	72.0	50	2.87	96.4
25	7.30	95.18	55	2.57	96.3
30	5.80	96.60	60	2.23	96.3
35	4.58	96.5	65	1.97	96.3

## SOLUBILITY OF TRI ETHYL AMINE IN MIXTURES OF WATER AND ETHYL ALCOHOL AT DIFFERENT TEMPERATURES.\*

(Meerburg — Z. phys. Ch. 40, 647, '02.)

0% Alcohol.		13.31% Alcohol.		28.98% Alcohol.		38.84% Alcohol.		60.16% Alcohol.	
t°.	G. $\text{N}(\text{C}_2\text{H}_5)_3$ per 100 g. sol.	t°.	G. $\text{N}(\text{C}_2\text{H}_5)_3$ per 100 g. sol.	t°.	G. $\text{N}(\text{C}_2\text{H}_5)_3$ per 100 g. sol.	t°.	G. $\text{N}(\text{C}_2\text{H}_5)_3$ per 100 g. sol.	t°.	G. $\text{N}(\text{C}_2\text{H}_5)_3$ per 100 g. sol.
69.2	1.7	38.3	8.2	54.5	22.8	73.4	31.2	76-77	71.2
30.8	5.6	31.7	13.9	45.0	29.8	65.4	33.3	74-75	75.0
23.1	8.5	28.0	21.6	33.4	51.1	51.6	40.6	72-73	80.0
18.7	25.8	26.4	30.6	31.4	63.7	42.1	50.6		
18.7	37.2	24.9	40.5	30.3	68.5	40.9	54.7		
19.5	51.8	24.2	49.8	28.5	82.2	34.2	70.6		
20.5	68.6	24.1	60.7	35.0	91.8	33.0	77.5		
20.5	84.0	24.0	69.7			34.7	88.0		
20.5	89.7	23.5	73.6			40.5	91.3		
21.4	92.4	24.0	81.5						
25.8	95.5	24.2	87.4						
26.5	96.1	25.0	92.0						

NOTE. — Results for Tri Ethyl Amine, Water and Ethyl Ether, and for Tri Ethyl Amine, Water and Phenol are also given by Meerburg.

100 gms. abs. methyl alcohol dissolve 57.5 grams  $\text{NH}(\text{C}_2\text{H}_5)_2$  at 19.5°.

100 gms. abs. ethyl alcohol dissolve 56.0 grams  $\text{NH}(\text{C}_2\text{H}_5)_2$  at 19.5°.

(de Bruyn — Z. phys. Ch. 10, 784, 1892.)

\* Determinations made by "Synthetic Method," see Note, page 9.

### SOLUBILITY OF DI PHENYL AMINE AND ALSO OF TRI PHENYL AMINE IN CARBON BISULPHIDE.

(Arctowski — Compt. rend. 121, 123, '95.)

NH(C <sub>6</sub> H <sub>5</sub> ) <sub>2</sub> in CS <sub>2</sub> .		N(C <sub>6</sub> H <sub>5</sub> ) <sub>3</sub> in CS <sub>2</sub> .	
t°.	Gms. per 100 Gms. Solution.	t°.	Gms. per 100 Gms. Solution.
-88½	0.87	-83	1.91
-117	0.37	-91	1.56
		-102	1.24
		-113½	0.98

### SOLUBILITY OF DI PHENYL AMINE IN HEXANE AND IN CARBON BISULPHIDE.

(Etard — Ann. chim. phys. [7] 2, 570, '94.)

Gms. NH(C <sub>6</sub> H <sub>5</sub> ) <sub>2</sub> per 100 Gms. Sol. in :			Gms. NH(C <sub>6</sub> H <sub>5</sub> ) <sub>2</sub> per 100 Gms. Sol. in :		
t°.	Hexane.	CS <sub>2</sub> .	t°.	Hexane.	CS <sub>2</sub> .
-60	...	1.3	0	2.6	33.7
-50	...	2.2	+10	3.8	46.8
-40	...	3.8	20	6.7	60.9
-30	0.5	7.2	30	13.8	76.0
-20	0.8	12.5	40	47.0	...
-10	1.4	21.6	50	94.0	...

### AMMONIA NH<sub>3</sub>.

#### SOLUBILITY OF AMMONIA IN WATER.

(Roscoe and Dittmar — Liebig's Annalen, 112, 334, '59; Raoult — Ann. chim. [5] 1, 262, '74; Mallet — Am. Ch. J. 19, 807, '97.)

At 760 mm. Pressure.			At 760 mm. Pressure.		
t°.	G. NH <sub>3</sub> per 100 g. H <sub>2</sub> O.	Vol. NH <sub>3</sub> per 1 g. H <sub>2</sub> O.	t°.	G. NH <sub>3</sub> per 100 g. H <sub>2</sub> O.	Vol. NH <sub>3</sub> per 1 g. H <sub>2</sub> O.
-40	294.6	...	20	52.6	710
-30	278.1	...	25	46.0	635
-20	176.8	...	30	40.3	595 (28°)
-10	111.5	...	35	35.5	...
0	87.5	1299	40	30.7	...
5	77.5	1019	45	27.0	...
10	67.9	910	50	22.9	...
15	60.0	802	56	18.5	...

### SOLUBILITY OF AMMONIA IN AQUEOUS SALT SOLUTIONS.

(Raoult.)

t°.	In Calcium Nitrate Solutions		In Potassium Hydroxide Solutions	
	Gms. NH <sub>3</sub> per 100 Gms. Solvent in:	Gms. NH <sub>3</sub> per 100 Gms. Solvent in:	Gms. NH <sub>3</sub> per 100 Gms. Solvent in:	Gms. NH <sub>3</sub> per 100 Gms. Solvent in:
	28.38% Ca(NO <sub>3</sub> ) <sub>2</sub> .	In 50.03% Ca(NO <sub>3</sub> ) <sub>2</sub> .	11.25% KOH.	25.25% KOH.
0	96.25	104.5	72.0	49.5
8	78.50	84.75	57.0	37.5
16	65.00	70.5	46.0	28.5
24	...	...	37.3	21.8

# AMMONIA

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## MUTUAL SOLUBILITY OF AQUEOUS AMMONIA AND POTASSIUM CARBONATE SOLUTIONS.

(Newth — J. Chem. Soc. 77, 776, 1900.)

The solutions used were: Potassium Carbonate saturated at 15° (contained 57.2 grams  $K_2CO_3$  per 100 cc.). Aqueous Ammonia of 0.885 Sp. Gr. (contained about 33 per cent ammonia). The determinations were made by adding successive small quantities of one of the solutions to a measured volume of the other, and observing the point at which opalescence appeared.

t°.	Saturated $K_2CO_3$ in Aq. Ammonia.		Aq. Ammonia in Saturated $K_2CO_3$ .	
	cc. $K_2CO_3$ per 100 cc. Ammonia.	% $K_2CO_3$ Solution in Mixture.	cc. Ammonia in 100 cc. $K_2CO_3$ .	% $K_2CO_3$ Solution in Mixture.
1	2.0	2.0	37.5	72.7
6	3.0	3.0	47.5	67.6
11	5.0	4.7	52.5	65.0
16	6.5	6.1	60.0	63.0
21	8.5	8.0	77.5	56.3
26	10.5	9.5	105.0	49.0
31	12.5	11.1	152.5	39.0
38	20.0	16.6	195.0	33.0
39	21.0	17.0	220.0	31.0
42	25.0	20.0	250.0	28.5
43	35.0	26.0	285.0	26.5

Above 43° the solutions are completely miscible. If 10 per cent of water is added to each solution the temperature of complete miscibility is lowered to 25°. The mutual solubilities are:

t°.	Per cent $K_2CO_3$ Solution in:	
	Ammonia Layer.	$K_2CO_3$ Sol. Layer.
0	8	62
10	11	52
20	15	38
25 (crit. pt.)	25	

With the addition of 12.9 per cent of water to each solution the temperature of complete miscibility (crit. pt.) is lowered to 10°. With the addition of 18.1 per cent water this temperature becomes 0°.

## SOLUBILITY OF AMMONIA IN ABSOLUTE ETHYL ALCOHOL.

(Delepine — J. pharm. chim. [5] 25, 496, 1892; de Bruyn — Rec. trav. chim. 11, 112, '92.)

t°.	Density.	Gms. $NH_3$ per 100 cc. Solution.	Gms. $NH_3$ per 100 Gms. Solution.		Gms. $NH_3$ per 100 Gms. Alcohol	
			(Delepine.)	(de Bruyn.)	(Delepine.)	(de Bruyn.)
0	0.782	13.05	20.95	19.7	26.5	24.5
5	0.784	12.00	19.00	17.5	23.0	21.2
10	0.787	10.85	16.43	15.0	19.6	17.8
15	0.789	9.20	13.00	13.2	15.0	15.2
20	0.791	7.50	10.66	11.5	11.9	13.2
25	0.794	6.00	10.0	10.0	11.0	11.2
30	0.798	5.15	9.7	8.8	10.7	9.5

SOLUBILITY OF AMMONIA IN AQUEOUS ETHYL ALCOHOL.  
(Delepine.)

t°.	In 96% Alcohol.		In 90% Alcohol.		In 80% Alcohol.	
	Sp. Gr. Solution.	G. NH <sub>3</sub> per 100 Gms. Sol.	Sp. Gr. Solution.	G. NH <sub>3</sub> per 100 Gms. Sol.	Sp. Gr. Solution.	G. NH <sub>3</sub> per 100 Gms. Sol.
0	0.783	24.5	0.800	30.25	0.808	39.0
10	0.803	18.6	0.794	28.8	0.800	28.8
20	0.788	14.8	0.795	15.8	0.821	19.1
30	0.791	10.7	0.796	11.4	0.826	12.2

t°.	In 60% Alcohol.		In 50% Alcohol.	
	Sp. Gr. Solution.	G. NH <sub>3</sub> per 100 Gms. Sol.	Sp. Gr. Solution.	G. NH <sub>3</sub> per 100 Gms. Sol.
0	0.830	50.45	0.835	69.77
10	0.831	37.3	0.850	43.86
20	0.842	26.1	0.869	33.8
30	0.846	21.2	0.883	25.2

SOLUBILITY OF AMMONIA IN ABSOLUTE METHYL ALCOHOL.  
(de Bruyn — Rec. trav. chim. 11, 112, '92.)

t°.	G. NH <sub>3</sub> per 100 Grams.		t°.	G. NH <sub>3</sub> per 100 Grams.	
	Solution.	Alcohol.		Solution.	Alcohol.
0	29.3	41.5	20	19.2	23.8
5	26.5	36.4	25	16.5	20.0
10	24.2	31.8	30	14.0	16.0
15	21.6	27.8			

DISTRIBUTION OF AMMONIA BETWEEN:

Water and Amyl Alcohol at 20°.

(Herz and Fischer — Ber. 37, 4747, '04.)

Gms. NH <sub>3</sub> per 100 cc.		G. M. NH <sub>3</sub> per 100 cc.	
Aq. Layer.	Alcoholic Layer.	Aq. Layer.	Alcoholic Layer.
0.5	0.072	0.25	0.0035
1.0	0.147	0.50	0.0073
2.0	0.272	1.00	0.0148
3.0	0.438	2.00	0.0295
4.0	0.595	3.00	0.0460
5.0	0.756		

Water and Chloroform at 20°.

(Dawson and McCrae — J. Ch. Soc. 79, 496, '01; see also Hantsch and Sebaldt — Z. phys. Ch. 30, 258, '99.)

Gms. NH <sub>3</sub> per 100 cc.		G. M. NH <sub>3</sub> per 100 cc.	
Aq. Layer.	CHCl <sub>3</sub> Layer.	Aq. Layer.	CHCl <sub>3</sub> Layer.
0.2	0.007	0.01	0.00038
0.4	0.015	0.02	0.00073
0.6	0.023	0.03	0.00114
0.8	0.031	0.04	0.00152
1.0	0.039	0.05	0.00193
1.2	0.046	0.06	0.00232
1.4	0.055	0.08	0.00311
1.6	0.063	0.10	0.00396

NOTE. — The influence of a large number of electrolytes upon the distribution of ammonia between water and chloroform was also investigated. For calculations of above distribution results, see Note, page 4.



## AMMONIUM ARSENATES

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### SOLUBILITY OF AMMONIUM CALCIUM ARSENATE AND AMMONIUM MAGNESIUM ARSENATE IN WATER, ETC.

(Field — J. Ch. Soc. 11, 6, '73.)

Solvent.	Grams per 100 Grams Solvent.	
	$\text{NH}_4\text{CaAsO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$ .	$\text{NH}_4\text{MgAsO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$ .
Water . . . . .	0.02	0.014
Aq. Ammonia 10% (Sp. Gr. 0.88) . . . . .	0.001	0.007
Aq. $\text{NH}_4\text{Cl}$ 5% . . . . .	0.415	...
Aq. $\text{NH}_4\text{Cl}$ 10% . . . . .	...	0.095

## AMMONIUM BENZOATE $\text{NH}_4\text{C}_6\text{H}_5\text{O}_2$ .

### SOLUBILITY IN WATER AND IN ALCOHOL.

t°.	Gms. $\text{NH}_4\text{C}_6\text{H}_5\text{O}_2$ per 100 Gms. Solvent in :	
	Water.	Alcohol.
25	9.52	4.0
b. pt.	83.33	13.2

## AMMONIUM BROMO PLATINATE $(\text{NH}_4)_2\text{PtBr}_6$ .

100 gms. sat. aq. solution contain 0.59 gm.  $(\text{NH}_4)_2\text{PtBr}_6$  at 20°.  
(Halberstadt — Ber. 17, 2965, '84.)

## AMMONIUM BROMIDE $\text{NH}_4\text{Br}$ .

### SOLUBILITY IN WATER.

(Eder — Abh. K. Akad. Wiss. (Berlin) 82 ii, 1284, '80.)

t°.	Gms. $\text{NH}_4\text{Br}$ per 100 Grams.		t°.	Gms. $\text{NH}_4\text{Br}$ per 100 Grams.	
	Solution.	Water.		Solution.	Water.
10	39.8	66.2	50	48.5	94.3
20	42.5	74.0	60	50.2	101.0
30	44.8	81.3	80	53.5	115.0
40	46.7	87.5	100	56.1	128.2

### SOLUBILITY OF AMMONIUM BROMIDE IN ABSOLUTE ETHYL ALCOHOL, METHYL ALCOHOL, AND IN ETHER.

(Eder; de Bruyn — Z. phys. Ch. 10, 783, '92.)

t°.	In Ethyl Alcohol. Gms. $\text{NH}_4\text{Br}$ per 100 Grams.		t°.	In Methyl Alcohol. Gms. $\text{NH}_4\text{Br}$ per 100 Grams.		In Ether (0.720 Sp. Gr.). Gms. $\text{NH}_4\text{Br}$ per 100 Grams.
	Solution.	Alcohol.		Solution.	Alcohol.	Ether.
15	2.97	3.06	...	...	...	0.123
19	3.12	3.22	11.1	12.5	...	...
78	9.50	10.50	...	...	...	...

### Solubility of Tetra Ethyl AMMONIUM BROMIDE $\text{N}(\text{C}_2\text{H}_5)_4\text{Br}$ , and of Tetra Methyl Ammonium Bromide $\text{N}(\text{CH}_3)_4\text{Br}$ in Acetonitril.

(Walden — Z. phys. Ch. 55, 712, '06.)

100 cc. sat. solution in  $\text{CH}_3\text{CN}$  contain 9.59 gms.  $\text{N}(\text{C}_2\text{H}_5)_4\text{Br}$  at 25°.  
100 cc. sat. solution in  $\text{CH}_3\text{CN}$  contain 0.17 gm.  $\text{N}(\text{CH}_3)_4\text{Br}$  at 25°.

## AMMONIUM CADMIUM BROMIDE $\text{NH}_4\text{Br} \cdot \text{CdBr}_2 \cdot \frac{1}{2}\text{H}_2\text{O}$ .

100 parts of water dissolve 137.0 parts  $\text{NH}_4\text{Br} \cdot \text{CdBr}_2 \cdot \frac{1}{2}\text{H}_2\text{O}$ .  
100 parts of alcohol dissolve 18.8 parts  $\text{NH}_4\text{Br} \cdot \text{CdBr}_2 \cdot \frac{1}{2}\text{H}_2\text{O}$ .  
100 parts of ether dissolve 0.36 part  $\text{NH}_4\text{Br} \cdot \text{CdBr}_2 \cdot \frac{1}{2}\text{H}_2\text{O}$ .  
(Eder — Dingler polyt. J. 221, 89, '76.)

## 21      AMMONIUM CARBONATE

### AMMONIUM CARBONATE $(\text{NH}_4)_2\text{CO}_3$ .

100 grams  $\text{H}_2\text{O}$  dissolve 100 grams  $(\text{NH}_4)_2\text{CO}_3 \cdot \text{H}_2\text{O}$  at  $15^\circ$ .

100 grams glycerine dissolve 20 grams  $(\text{NH}_4)_2\text{CO}_3$  at  $15^\circ$ .

(Divers — J. Ch. Soc. 23, 171, '70.)

### AMMONIUM BICARBONATE $\text{NH}_4\text{HCO}_3$ .

#### SOLUBILITY IN WATER.

(Dibbits — J. pr. Ch. [2] 10, 417, '74.)

t°.	Gms. $\text{NH}_4\text{HCO}_3$ per 100 Grams.		t°.	Grams $\text{NH}_4\text{HCO}_3$ per 100 Grams.	
	Solution.	Water.		Solution.	Water.
0	10.6	11.9	20	17.4	21.0
5	12.1	13.7	25	19.3	23.9
10	13.7	15.8	30	21.3	27.0
15	15.5	18.3			

#### SOLUBILITY OF AMMONIUM BICARBONATE IN AQUEOUS SOLUTIONS OF AMMONIUM CHLORIDE SATURATED WITH $\text{CO}_2$ .

(Fedotieff — Z. phys. Ch. 49, 168, '04.)

t°.	Wt. of 1 cc. Sol.	Per 1000 cc. Solution.				Per 1000 Grams $\text{H}_2\text{O}$ .			
		G. M. $\text{NH}_4\text{Cl}$	G. M. $\text{NH}_4\text{HCO}_3$	Gms. $\text{NH}_4\text{Cl}$	Gms. $\text{NH}_4\text{HCO}_3$	G. M. $\text{NH}_4\text{Cl}$	G. M. $\text{NH}_4\text{HCO}_3$	Gms. $\text{NH}_4\text{Cl}$	Gms. $\text{NH}_4\text{HCO}_3$
0	...	...	...	...	...	0.0	1.22	0.0	119.0
0	1.077	4.41	0.37	235.9	29.2	5.42	0.46	290.8	36.0
15	1.064	0.0	2.12	0.0	167.2	0.0	2.36	0.0	186.4
15	1.063	0.5	1.84	26.8	145.2	0.56	2.06	29.9	162.9
15	1.062	1.0	1.59	53.5	125.5	1.13	1.80	60.6	142.2
15	1.062	1.41	1.42	75.4	112.2	1.59	1.60	85.1	126.9
15	1.065	1.89	4.28	100.8	101.1	2.18	1.48	116.8	116.8
15	1.069	2.87	0.99	153.3	78.2	3.42	1.18	183.0	93.3
15	1.076	3.84	0.79	205.2	62.5	5.03	0.98	269.3	77.3
15	1.085	4.82	0.65	257.9	51.4	6.21	0.84	332.5	66.4
15	1.085	4.95	0.62	264.8	48.9	6.40	0.81	343.5	64.2
30	...	...	...	...	...	0.0	3.42	0.0	270.0
30	...	...	...	...	...	7.4	1.15	397.0	91.0

#### SOLUBILITY OF AMMONIUM BICARBONATE IN AQUEOUS SOLUTIONS OF SODIUM BICARBONATE SATURATED WITH $\text{CO}_2$ .

(Fedotieff.)

t°.	Wt. of 1 cc. Sol.	Per 1000 cc. Solution.				Per 1000 Grams $\text{H}_2\text{O}$ .			
		G. M. $\text{NaHCO}_3$	G. M. $\text{NH}_4\text{HCO}_3$	Gms. $\text{NaHCO}_3$	Gms. $\text{NH}_4\text{HCO}_3$	G. M. $\text{NaHCO}_3$	G. M. $\text{NH}_4\text{HCO}_3$	Gms. $\text{NaHCO}_3$	Gms. $\text{NH}_4\text{HCO}_3$
0	...	...	...	...	...	0.0	1.51	0.0	119.0
0	1.072	0.53	1.28	44.6	101.4	0.58	1.39	48.2	109.4
15	1.064	0.0	2.12	0.0	167.2	0.0	2.36	0.0	186.4
15	1.090	0.63	1.92	52.5	151.3	0.71	2.16	59.2	170.6
30	...	...	...	...	...	0.0	3.42	0.0	270.0
30	...	...	...	...	...	0.83	2.91	70.0	230.0

# **AMMONIUM BICARBONATE 22**

**SOLUBILITY OF MIXTURES OF AMMONIUM BICARBONATE, SODIUM BICARBONATE, AND AMMONIUM CHLORIDE IN WATER SATURATED WITH CO<sub>2</sub>.**  
(Fedotieff.)

t°.	Wt. of 1 cc. Sol.	Gram Mols. per 1000 Gms. H <sub>2</sub> O.			Gms. per 1000 Gms. H <sub>2</sub> O.			Solid Phase.
		NaHCO <sub>3</sub>	NaCl.	NH <sub>4</sub> Cl.	NaHCO <sub>3</sub>	NaCl.	NH <sub>4</sub> Cl.	
0	1.114	0.59	0.96	4.92	49.61	56.16	263.4	a + b + c
0	1.187	0.12	4.83	2.74	10.09	282.6	146.7	"
15	1.116	0.93	0.51	6.28	78.18	29.84	336.2	"
15	1.178	0.18	4.44	3.73	15.13	259.8	199.6	"
15	1.151	0.30	3.09	4.56	25.22	180.8	244.1	a + c
15	1.128	0.51	1.68	5.45	42.87	98.28	291.7	"
15	1.112	0.99	0.35	5.65	83.22	20.47	302.4	a + b
15	1.108	1.07	0.20	5.21	89.95	11.70	278.9	"
15	1.106	1.12	0.11	4.92	94.14	6.44	263.4	"
15	1.101	1.16	0.14	4.00	97.52	8.19	214.1	"
15	1.090	0.93	0.95	2.03	78.18	55.58	108.6	"

a = NaHCO<sub>3</sub>,

b = NH<sub>4</sub>HCO<sub>3</sub>,

c = NH<sub>4</sub>Cl.

# **AMMONIUM URANYL CARBONATE 2(NH<sub>4</sub>)<sub>2</sub>CO<sub>3</sub>UO<sub>2</sub>CO<sub>3</sub>.** (Ebelmen.)

100 grams H<sub>2</sub>O dissolve 5 grams of the salt at 15°.

# **AMMONIUM LEAD COBALTICYANIDE NH<sub>4</sub>PbCo(CN)<sub>6</sub>·3H<sub>2</sub>O.** (Schuler — Sitz. Ber. K. Akad. W. (Berlin) 79, 302.)

100 grams H<sub>2</sub>O dissolve 12.0 grams of the salt at 18°.

# **AMMONIUM CHLORIDE NH<sub>4</sub>Cl.**

**SOLUBILITY IN WATER.**  
(Mulder; below 0°, Meerburg — Z. anorg. Ch. 37, 203, 1903.)

t°.	Gms. NH <sub>4</sub> Cl per 100 Gms.		t°.	Gms. NH <sub>4</sub> Cl per 100 Gms.	
	Solution.	Water.		Solution.	Water.
-15	19.7	24.5	40	31.4	45.8
-10.9	20.3	25.5	50	33.5	50.4
-5.7	21.7	27.7	60	35.6	55.2
0	22.7	29.4	70	37.6	60.2
+ 5	23.8	31.2	80	39.6	65.6
10	24.9	33.3	90	41.6	71.3
15	26.0	35.2	100	43.6	77.3
20	27.1	37.2	110	45.6	83.8
25	28.2	39.3	115.6	46.6	87.3
30	29.3	41.4			

Density of saturated solution at 0° = 1.088, at 15° = 1.077, at 19° = 1.075.

**SOLUBILITY OF AMMONIUM CHLORIDE IN AQUEOUS AMMONIUM BICARBONATE SOLUTIONS SATURATED WITH CO<sub>2</sub>.**

(Fedotieff—Z. phys. Ch. 49, 169, 1904.)

t°.	Wt. of 1 cc. Sol.	Per 1000 cc. Solution.				Per 1000 Gms. H <sub>2</sub> O.			
		G. M. NH <sub>4</sub> HCO <sub>3</sub> .	G. M. NH <sub>4</sub> Cl.	Gms. NH <sub>4</sub> HCO <sub>3</sub> .	Gms. NH <sub>4</sub> Cl.	G. M. NH <sub>4</sub> HCO <sub>3</sub> .	G. M. NH <sub>4</sub> Cl.	Gms. NH <sub>4</sub> HCl.	Gms. NH <sub>4</sub> Cl.
0	1.069	0.0	4.60	0.0	246.1	0.0	5.57	0.0	298.0
0	1.077	0.37	4.41	29.2	235.9	0.46	5.42	36.0	290.8
15	1.077	0.0	5.29	0.0	283.1	0.0	6.64	0.0	355.0
15	1.085	0.62	4.95	48.9	264.8	0.81	6.40	64.2	343.5
30	...	...	...	...	...	0.0	7.78	0.0	416.4
30	...	...	...	...	...	1.15	7.40	91.0	397.0

**SOLUBILITY OF AMMONIUM CHLORIDE IN AQUEOUS SOLUTIONS OF SODIUM CHLORIDE SATURATED WITH CO<sub>2</sub>.**

(Fedotieff.)

t°.	Wt. of 1 cc. Sol.	Per 1000 cc. Solution.				Per 1000 Gms. H <sub>2</sub> O.			
		G. M. NaCl.	G. M. NH <sub>4</sub> Cl.	Gms. NaCl.	Gms. NH <sub>4</sub> Cl.	G. M. NaCl.	G. M. NH <sub>4</sub> Cl.	Gms. NaCl.	Gms. NH <sub>4</sub> Cl.
0	1.069	0.0	4.60	0.0	246.1	0.0	5.57	0.0	298.0
0	1.085	4.04	2.26	236.5	121.0	4.89	2.73	286.4	146.1
15	1.077	0.0	5.29	0.0	283.1	0.0	6.64	0.0	355.0
15	1.097	0.81	4.71	47.5	252.1	1.02	5.91	59.8	316.4
15	1.120	1.68	4.13	98.0	221.7	2.09	5.18	122.4	277.0
15	1.153	2.87	3.38	168.0	180.7	3.57	4.20	208.9	224.7
15	1.175	3.65	2.98	213.5	159.4	4.55	3.72	266.8	198.8
30	...	...	...	...	...	0.0	7.78	0.0	416.4
30	1.166	3.30	3.70	193.0	198.0	4.26	4.77	249.0	255.4
45	...	...	...	...	...	0.0	9.03	0.0	483.7
45	...	...	...	...	...	4.0	6.02	233.9	322.1

**SOLUBILITY OF AMMONIUM CHLORIDE IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID AT 0°.**

(Engel—Ann. chim. phys. [6] 13, 379, '88.)

Sp. Gr. of Solutions.	Milligram Molecules per 10 cc. Solution.		Grams per 100 cc. Solution.	
	HCl.	NH <sub>4</sub> Cl.	HCl.	NH <sub>4</sub> Cl.
1.076	0.0	46.12	0.0	24.61
1.069	2.9	43.6	1.05	23.16
1.070	5.5	41.0	1.99	21.78
1.071	7.85	39.15	2.84	20.79
1.073	10.85	36.45	3.93	19.36
1.078	21.4	27.37	7.74	14.54
1.106	53.0	10.87	19.18	5.78
1.114	61.0	8.8	22.07	4.67

Sat. HCl at 12°      3.7 at 17°

# AMMONIUM CHLORIDE

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## SOLUBILITY IN AQUEOUS AMMONIA SOLUTIONS AT 0°.

(Engel — Bull. soc. chim. [3] 6, 17, 1891.)

Sp. Gr. of Solutions.	Milligram Molecules per 10 cc. Solution.		Grams per 100 cc. Solution.	
	NH <sub>3</sub> .	NH <sub>4</sub> Cl.	NH <sub>4</sub> OH.	NH <sub>4</sub> Cl.
1.067	5.37	45.8	0.92	24.52
1.054	12.02	45.5	2.05	24.35
1.031	38.0	44.5	6.48	23.82
1.025	47.0	44.0	8.02	23.56
1.017	54.5	43.63	9.30	23.35
0.993	80.0	43.12	13.66	23.09
0.992	90.0	44.0	15.36	23.56
0.983	95.5	44.37	16.29	23.75
0.953	130.0	49.75	22.18	26.63
0.931	169.75	60.0	28.97	32.14

## SOLUBILITIES OF MIXTURES OF AMMONIUM CHLORIDE AND OTHER SALTS IN WATER.

(Rüdorff, Karsten, Mulder.)

Both salts present in solid phase.

t°.	Grams per 100 Grams H <sub>2</sub> O.				t°.	Grams per 100 Grams H <sub>2</sub> O.			
	NH <sub>4</sub> Cl.	NH <sub>4</sub> NO <sub>3</sub> .	R			NH <sub>4</sub> Cl.	KCl.	M	
19.5	29.2	174.0	R		b. pt.	67.7	21.9	KCl	M
21.5	26.8	" + 46.5 (NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub>	R		14.8	38.8	" + 34.2	KNO <sub>3</sub>	K
20.0	33.8	" + 11.6 BaCl <sub>2</sub>	R		18.5	39.8	" + 38.6	KNO <sub>3</sub>	K
18.5	39.2	" + 17.0 Ba(NO <sub>3</sub> ) <sub>2</sub>	K		14.0	36.8	" + 14.1	K <sub>2</sub> SO <sub>4</sub>	R
15.0	28.9	" + 16.9 KCl	R		18.7	37.9	" + 13.3	K <sub>2</sub> SO <sub>4</sub>	K
22.0	30.4	" + 19.1 KCl	R		18.7	22.9	" + 23.9	NaCl	R

## SOLUBILITY OF AMMONIUM CHLORIDE IN ABSOLUTE ETHYL AND METHYL ALCOHOL AT 19° AND IN AQUEOUS ETHYL ALCOHOL SOLUTIONS.

100 grams absolute ethyl alcohol dissolve 0.62 grams NH<sub>4</sub>Cl.  
100 grams absolute methyl alcohol dissolve 3.35 grams NH<sub>4</sub>Cl.

(de Bruyn — Rec. trav. chim. 11, 156, '92.)

### In Aqueous Alcohol at 30°.

(Bathrick — J. Physic. Chem. 1, 159, '96.)

Wt. per cent Alcohol.	G. NH <sub>4</sub> Cl per 100 g. Alcohol.	Wt. per cent Alcohol.	G. NH <sub>4</sub> Cl per 100 g. Alcohol.
0	40.4	45.9	17.0
8.3	35.3	54.3	14.0
16.9	31.8	65.0	9.6
25.9	27.5	75.6	6.4
34.4	21.7	87.9	2.9

### In Aq. Alcohol of 45 Wt. %.

(Gerardin — Ann. chim. phys. [4] 5, 147, '65.)

t°.	G. NH <sub>4</sub> Cl per 100 g. Alcohol.
4	11.2
8	12.6
27	19.4
38	23.6
56	30.1

**SOLUBILITY OF AMMONIUM CHLORIDE IN AQUEOUS GLYCERINE SOLUTIONS AND IN AQUEOUS ACETONE SOLUTIONS AT 25°.**

(Herz and Knoch — Z. anorg. Chem. 45, 263, 267, '05.)

**In Aqueous Glycerine.**

(Sp. Gr. of Glycerine 1.255, Impurity about 1.5%.)

Wt. % Glycerine.	NH <sub>4</sub> Cl per 100 cc. Solution.		Sp. Gr. at 25° 4°.
	Millimols.	Grams.	
0.	585.1	31.32	1.0793
13.28	544.6	29.16	1.0947
25.98	502.9	26.93	1.1127
45.36	434.4	23.26	1.1452
54.23	403.5	21.60	1.1606
83.84	291.4	15.60	1.2225
100.00	228.4	12.23	1.2617

**In Aqueous Acetone.**

Vol. % Acetone.	NH <sub>4</sub> Cl per 100 cc. Solution.		Sp. Gr. at 25° 4°.
	Millimols.	Grams.	
0	585.1	31.32	1.0793
10	534.1	28.59	1.0618
20	464.6	24.87	1.0451
30	396.7	21.23	1.0263
40	328.5	17.59	0.9998
*46.5 L	283.7	15.19	0.9800
*85.7 U	18.9	1.01	0.8390
90	9.4	0.50	0.8274

\* Between these two concentrations of acetone, the solution separates into two layers. L indicates lower layer, U indicates upper layer.

**Solubility of Tetra Ethyl AMMONIUM CHLORIDE N(C<sub>2</sub>H<sub>5</sub>)<sub>4</sub>Cl, and also of Tetra Methyl Ammonium Chloride N(CH<sub>3</sub>)<sub>4</sub>Cl in Acetonitril.**

100 cc. sat. solution in CH<sub>3</sub>CN contain 29.31 gms. N(C<sub>2</sub>H<sub>5</sub>)<sub>4</sub>Cl at 25°.

100 cc. sat. solution in CH<sub>3</sub>CN contain 0.265 gms. N(CH<sub>3</sub>)<sub>4</sub>Cl at 25°.

(Walden — Z. physik. Chem. 55, 712, '06.)

**AMMONIUM CHROMATES.****SOLUBILITY IN WATER AT 30°.**

(Schreinemaker — Z. physik. Chem. 55, 89, '06.)

Composition in Wt. per cent of:				Solid Phase.
The Solution.		The Residue.		
% CrO <sub>3</sub> .	% NH <sub>3</sub> .	% CrO <sub>3</sub> .	% NH <sub>3</sub> .	
6.933	22.23	...	...	(NH <sub>4</sub> ) <sub>2</sub> CrO <sub>4</sub>
9.966	16.53	47.59	20.44	"
16.973	8.20	...	...	"
22.53	6.37	38.03	12.15	"
27.09	6.87	48.02	12.01	(NH <sub>4</sub> ) <sub>2</sub> CrO <sub>4</sub> + (NH <sub>4</sub> ) <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub>
26.19	5.70	47.38	8.81	(NH <sub>4</sub> ) <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub>
25.99	5.10	41.56	7.58	"
30.16	3.50	...	...	"
38.89	3.10	61.08	8.80	"
42.44	3.15	59.72	6.75	(NH <sub>4</sub> ) <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> + (NH <sub>4</sub> ) <sub>2</sub> Cr <sub>2</sub> O <sub>10</sub>
44.08	2.27	54.90	4.14	(NH <sub>4</sub> ) <sub>2</sub> Cr <sub>2</sub> O <sub>10</sub>
52.91	1.11	60.88	3.09	"
54.56	1.03	63.07	3.09	(NH <sub>4</sub> ) <sub>2</sub> Cr <sub>2</sub> O <sub>10</sub> + (NH <sub>4</sub> ) <sub>2</sub> Cr <sub>2</sub> O <sub>12</sub>
56.57	0.97	65.70	2.95	(NH <sub>4</sub> ) <sub>2</sub> Cr <sub>2</sub> O <sub>12</sub>
58.87	0.65	69.74	3.24	"
62.48	0.46	71.93	3.10	"
63.60	0.40	73.68	1.18	(NH <sub>4</sub> ) <sub>2</sub> Cr <sub>2</sub> O <sub>12</sub> + CrO <sub>3</sub>
63.66	0.41	71.47	2.07	"
62.94	0.21	...	...	CrO <sub>3</sub>
62.28	0.0	...	...	CrO <sub>3</sub>

100 gms. of the sat. aq. solution contain 28.80 gms. (NH<sub>4</sub>)<sub>2</sub>CrO<sub>4</sub> at 30°.

100 gms. of the sat. aq. solution contain 32.05 gms. (NH<sub>4</sub>)<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> at 30°.

## AMMONIUM FLUOBORIDE 26

### AMMONIUM FLUOBORIDE $\text{NH}_4\text{BF}_4$ .

100 parts of water dissolve 25 parts salt at  $16^\circ$ , and about 97 parts at b. pt.

(Stolba — Chem. Techn. Cent. Anz. 7, 459.)

### AMMONIUM FORMATE $\text{HCOONH}_4$ , and also Ammonium Acid Formate.

#### SOLUBILITY IN WATER. (Groschuff — Ber. 36, 4351, '03.)

t°.	Gms. HCOONH <sub>4</sub> per 100 Gms. Solution. Water.		Solid. Phase.	t°.	Gms. per 100 Gms. Solution.		Solid. Phase.
	HCOONH <sub>3</sub> + HCOOH.						
-20	41.9	72	HCOONH <sub>4</sub>	- 6.5	46.7	34.1	HCOONH <sub>4</sub> , HCOOH
0	50.5	102	"	+ 1.5	49.6	36.2	"
20	58.9	143	"	6.0	51.3	37.4	"
40	67.1	204	"	8.5	52.1	38.0	"
60	75.7	311	"	- 7	49.6	36.2	HCOONH <sub>4</sub> labil.
80	84.2	531	"	+ 13	53.0	38.6	" stabil.
116 f. pt.				29	55.8	40.7	"
				39	57.8	42.2	H <sub>2</sub> O free solution.

#### SOLUBILITY OF AMMONIUM FORMATE IN FORMIC ACID SOLUTIONS. (Groschuff.)

30 grams of  $\text{HCOONH}_4$  dissolved in weighed amounts of formic acid and cooled to the point at which a solid phase separated.

t°.	Gms. $\text{HCOONH}_4$ per 100 Gms. Solution.		G. M. $\text{HCOONH}_4$ per 100 G. M. $\text{HCOOH}$ .	Solid Phase.	t°.	Gms. $\text{HCOONH}_4$ per 100 Gms. Solution.		G. M. $\text{HCOONH}_4$ per 100 G. M. $\text{HCOOH}$ .	Solid Phase.
- 3	35.3	39.9		$\text{HCOONH}_4$ $\text{HCOOH}$	11 39	50.0 57.8	73.0 100.0		$\text{HCOONH}_4$ labil. " stabil.
+ 8.5	40.6	49.9		"	78	73.1	199.0		" "
21.5	50.0	73.0		"	116 m.pt.	100.0	$\infty$		" "

### AMMONIUM IODATE $\text{NH}_4\text{IO}_3$ .

100 parts  $\text{H}_2\text{O}$  dissolve 2.6 parts salt at  $15^\circ$  and 14.5 parts at  $100^\circ$ .

(Rammelsberg — Pogg. Ann. 44, 555, 1838.)

### Tetra Methyl AMMONIUM IODIDE $\text{N}(\text{CH}_3)_4\text{I}$ .

#### SOLUBILITY IN SEVERAL SOLVENTS. (Walden — Z. physik. Chem. 55, 708, '06.)

Solvent.	Formula.	t°.	Sp. Gr. of Solution.	Gms. $\text{N}(\text{CH}_3)_4\text{I}$ per 100.	
				cc. Solution.	Gms. Solution.
Water	$\text{H}_2\text{O}$	0	1.0188	2.01	1.97
Water	$\text{H}_2\text{O}$	25	1.0155	5.31-5.89	5.22
Methyl Alcohol	$\text{CH}_3\text{OH}$	0	0.8025	0.18-0.22	0.22
Methyl Alcohol	$\text{CH}_3\text{OH}$	25	0.7920	0.38-0.42	0.48
Ethyl Alcohol	$\text{C}_2\text{H}_5\text{OH}$	25	0.7894	0.09	...
Glycol	$(\text{CH}_2\text{OH})_2$	0	...	1.014	...
Glycol	$(\text{CH}_2\text{OH})_2$	25	1.0678	0.240	0.224
Acetonitril	$\text{CH}_3\text{CN}$	25	...	0.650	...
Nitro Methane	$\text{CH}_3\text{NO}_2$	0	1.1387	0.25-0.32	0.22
Nitro Methane	$\text{CH}_3\text{NO}_2$	25	1.1285	0.34-0.38	0.21
Acetone	$(\text{CH}_3)_2\text{CO}$	0	...	0.118	...
Acetone	$(\text{CH}_3)_2\text{CO}$	25	...	0.187	...
Salicyl Aldehyde	$\text{C}_6\text{H}_4.\text{OH}.\text{COH}$	0	1.1492	0.302	0.263
Salicyl Aldehyde	$\text{C}_6\text{H}_4.\text{OH}.\text{COH}$	25	1.1379	0.510	0.484

Tetra Ethyl AMMONIUM IODIDE  $N(C_2H_5)_4I$ .

## SOLUBILITY IN SEVERAL SOLVENTS.

(Walden — Z. physik. Chem. 55, 693, '06.)

Solvent.	Formula.	t°.	Sp. Gr. of Solution.	Gms. $N(C_2H_5)_4I$ per 100.	
				cc. Solution.	Gms. Solution.
Water	$H_2O$	0	1.0470	16.31	15.58
Water	$H_2O$	25	1.1021	36.33(35.5)	13.44
Methyl Alcohol	$CH_3OH$	0	0.8326	3.7-4.3	4.44
Methyl Alcohol	$CH_3OH$	25	0.8463	10.5 (10.7)	12.29
Ethyl Alcohol	$C_2H_5OH$	0	0.7928	0.348	0.439
Ethyl Alcohol	$C_2H_5OH$	25	0.7844	0.98 (0.88)	1.249
Glycol	$(CH_2OH)_2$	0	1.1039	3.27	2.97
Glycol	$(CH_2OH)_2$	25	1.0904	7.63 (7.55)	7.00
Acetonitril	$CH_3CN$	0	0.8163	2.24	2.74
Acetonitril	$CH_3CN$	25	0.7929	3.04 (3.54)	3.83
Propionitril	$CH_3CH_2CN$	0	0.8059	0.618	0.767
Propionitril	$CH_3CH_2CN$	25	0.7830	0.81-1.01	1.29
Benzonitril	$C_6H_5CN$	25	...	0.467	...
Methyl Sulphocyanide	$CH_3SCN$	25	1.0828	4.40	4.06
Ethyl Sulphocyanide	$C_2H_5SCN$	25	1.0012	0.475	0.47
Nitro Methane	$CH_3NO_2$	0	1.1658	3.59	3.004
Nitro Methane	$CH_3NO_2$	25	1.1476	5.61-6.27	5.61
Nitroso Dimethylin	$(CH_3)_2N.NO$	25	1.0059	2.67	2.66
Acetyl Acetone	$CH_3COCH_2COOCH_3$	25	...	0.268	...
Furfural	$C_4H_3O.COCH_3$	0	1.1738	3.91	3.33
Furfural	$C_4H_3O.COCH_3$	25	1.1692	5.33	4.55
Benzaldehyde	$C_6H_5COH$	25	...	0.43	...
Salicylaldehyde	$C_6H_4.OH.COCH_3$	25	...	change- able-17.7	...
Anisaldehyde	$C_6H_4.OCH_3.COCH_3$	25	...	0.59	...
Acetone	$(CH_3)_2CO$	0	0.7991	0.174	0.218
Acetone	$(CH_3)_2CO$	25	...	0.249	0.218
Ethyl Acetate	$CH_3COOC_2H_5$	25	...	0.00039	...
Ethyl Nitrate	$C_2H_5ONO_2$	25	1.0984	0.062	0.056
Benzoyl Ethyl Acetate	$C_6H_5COCH_2COOC_2H_5$	25	1.1303	0.321	0.284
Di-Methyl Malonate	$CH_2(COOCH_3)_2$	25	1.1335	0.040	0.035
Methyl Cyan Acetate	$CH_3CNCOOCH_3$	0	1.1341	1.82	1.605
Methyl Cyan Acetate	$CH_3CNCOOCH_3$	25	...	2.83	...
Ethyl Cyan Acetate	$CH_3CNCOOC_2H_5$	0	1.0760	1.057	0.981
Ethyl Cyan Acetate	$CH_3CNCOOC_2H_5$	25	1.0607	1.71	1.41



# AMMONIUM IODIDE

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## Tetra Propyl AMMONIUM IODIDE $N(C_2H_5)_4I$ .

### SOLUBILITY IN SEVERAL SOLVENTS.

(Walden — Z. physik. Chem. 55, 709, '06.)

Solvent.	Formula.	t°.	Sp. Gr. of Solution.	Gms. $N(C_2H_5)_4I$ per 100.	
				cc. Solution.	Gms. Solution.
Methyl Alcohol	$CH_3OH$	0	0.9756	40.92	41.94
Methyl Alcohol	$CH_3OH$	25	1.0187	56.42	55.37
Ethyl Alcohol	$C_2H_5OH$	0	0.8349	6.5-6.8	8.14
Ethyl Alcohol	$C_2H_5OH$	25	0.8716	19.88-20.29	23.28
Acetonitril	$CH_3CN$	0	0.8553	13.03	15.24
Acetonitril	$CH_3CN$	25	0.8584	18.69	21.77
Propionitril	$C_2H_5CN$	0	0.8280	6.37	7.66
Propionitril	$C_2H_5CN$	25	0.8191	9.65	11.76
Benzonitril	$C_6H_5CN$	25	1.0199	8.44	8.35
Nitro Methane	$CH_3NO_2$	0	1.181	14.79	12.52
Nitro Methane	$CH_3NO_2$	25	1.158	22.24	19.21
Nitro Benzol	$C_6H_5NO_2$	25	1.193	5.71	4.79
Benzaldehyde	$C_6H_5COH$	0	1.0581	7.06	6.67
Benzaldehyde	$C_6H_5COH$	25	1.0549	9.87	9.35
Anisaldehyde	$C_6H_5OCH_3COH$	0	1.1114	5.60	5.04
Anisaldehyde	$C_6H_5OCH_3COH$	25	1.1004	6.75	6.14
Salicylaldehyde	$C_6H_4OH.COH$	52	...	39.28	...
Ethyl nitrite	$C_2H_5ONO_2$	0	1.1207	0.522	0.466
Ethyl nitrite	$C_2H_5ONO_2$	25	1.1025	0.653	0.592
Di-Methyl Malonate	$CH_3(COOCH_3)_2$	0	1.1532	0.298	0.259
Di-Methyl Malonate	$CH_3(COOCH_3)_2$	25	1.1345	0.320	0.282
Acetone	$(CH_3)_2C=O$	0	0.8259	2.692	3.26
Acetone	$(CH_3)_2C=O$	25	0.8049	3.944	4.90
Ethyl Acetate	$CH_3COOC_2H_5$	25	0.8975	0.0063	0.007

## AMMONIUM NITRATE $NH_4NO_3$ .

### SOLUBILITY IN WATER.

(Schwarz — Ostwald's Lehrbuch, 2d ed. p. 425; Muller and Kaufmann — Z. physik. Chem. 42, 497, '01-'02.)

t°.	Sp. Gr. Solution.	G. Mols. $NH_4NO_3$ per 100 Mols. $H_2O$ .	Gms. $NH_4NO_3$ per 100 Gms.		Solid Phase.
			Solution.	Water.	
0	...	26.63	54.19	118.3	$NH_4NO_3$ rhomb. $\beta$
12.2	1.2945	34.50	60.53	153.4	"
20.2	1.3116	43.30	65.80	192.4	"
25.0	1.3197	48.19	68.17	214.2	"
30.0	1.3299	54.40	70.73	241.8	"
32.1	1.3344	57.60	71.97	256.9	$NH_4NO_3$ rhomb. $\beta$ + rhomb. $\alpha$
35.0	1.3394	59.80	72.64	265.8	$NH_4NO_3$ rhomb. $\alpha$
40.0	1.3464	66.80	74.82	297.0	"
50.0	...	77.41	77.49	344.0	"
60.0	...	94.73	80.81	421.0	"
70.0	...	112.30	83.32	499.0	"
80.0	...	130.50	85.25	580.0	"
90.0	...	166.50	88.08	740.0	$NH_4NO_3$ rhombohedral?
100.0	...	196.00	89.71	871.0	"

## SOLUBILITIES OF MIXTURES OF AMMONIUM NITRATE AND OTHER SALTS.

(Rüdorff — Mulder.)

100 gms.  $H_2O$  dissolve 162.9 gms.  $NH_4NO_3$  + 77.1 gms.  $NaNO_3$  at 16° R.100 gms.  $H_2O$  dissolve 88.8 gms.  $NH_4NO_3$  + 40.6 gms.  $KNO_3$  at 9° M.100 gms.  $H_2O$  dissolve 101.3 gms.  $NH_4NO_3$  + 6.2 gms.  $Ba(NO_3)_2$  at 9° M.

## SOLUBILITY OF AMMONIUM NITRATE IN AMMONIA.

(Kuriloff — Z. physik. Chem. 25, 109, '98.)

t°.	Gms. $NH_4NO_3$	Gms. $NH_3$	Mols. $NH_4NO_3$ per 100 Mols. $NH_4NO_3 + NH_3$	t°.	Gms. $NH_4NO_3$	Gms. $NH_3$	Mols. $NH_4NO_3$ per 100 Mols. $NH_4NO_3 + NH_3$
-80	0	100	0.0	33.3	0.9358	0.2352	45.9
-60	1.3918	4.4327	6.25	35.9	0.7746	0.1857	47.0
-44.5	0.9526	1.2457	13.9	68.8	4.2615	0.7747	53.8
-30	0.8308	0.3700	32.3	94.0	0.6439	0.0665	67.3
-10.5	0.9675	0.3515	36.9	190.8	0.7578	0.0588	74.2
0	0.7600	0.2607	38.3	168.0	...	...	100.0

t° = temperature of equilibrium between solution and solid phase.

## SOLUBILITY OF AMMONIUM NITRATE IN NITRIC ACID.

(Groschuff — Ber. 37, 1488, '04.)

Determinations by the "Synthetic Method," see Note, page 9.

t°.	Gms. $NH_4NO_3$ per 100 Gms. Sol.	Mols. $NH_4NO_3$ per 100 Mols. $HNO_3$	Solid Phase.	t°.	Gms. $NH_4NO_3$ per 100 Gms. Sol.	Mols. $NH_4NO_3$ per 100 Mols. $HNO_3$	Solid Phase.
8	21.1	21.1	$NH_4NO_3 \cdot 2HNO_3$	11.0	51.7	84.3	$NH_4NO_3 \cdot HNO_3$
23	28.7	31.6	"	12.0	54.7	95.1	" labil.
29.5 m.pt.	38.8	50.0	"	11.5	57.6	108.0	" b
27.5	44.6	63.4	"	11.5	54.0	92.4	$NH_4NO_3$ labil.
23.5	49.4	76.8	"	17.0	54.7	95.1	" stabil.
17.5	54.0	92.4	"	27.0	56.2	101.0	"
16.5	54.3	93.5	"	49.0	60.4	120.0	"
4.0	45.8	66.7	$NH_4NO_3 \cdot HNO_3$ labil.	79.0	68.1	168.0	"

a = solution in  $HNO_3$ .b = solution in  $NH_4NO_3$ .

## SOLUBILITY OF AMMONIUM TRI-NITRATE IN WATER.

(Groschuff.)

t°.	Gms. $NH_4NO_3$ per 100 Gms. Solution.	Gms. $HNO_3$ per 100 Gms. Solution.	Mols. $NH_4NO_3$ * per 100 Mols. $H_2O$	Mols. $NH_4NO_3$ per 100 total Mols. Solution.	Solid Phase.
-8	34.2	53.9	64.3	22.0	$NH_4NO_3 \cdot 2HNO_3$
-2.5	34.8	54.8	75.1	23.1	"
+3.0	35.4	55.8	90.0	24.3	"
8.5	36.6	56.9	113.0	25.7	"
19.5	37.4	58.9	225.0	29.0	"
25.0	38.1	60.0	450.0	31.0	"
29.5 m. pt.	38.8	61.2	0.0	∞	"

\* or  $NH_4NO_3 \cdot 2HNO_3$ .

# AMMONIUM NITRATE

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## SOLUBILITY OF AMMONIUM NITRATE IN AQUEOUS ETHYL ALCOHOL.

(Fleckenstein — *Physic. Z.* 6, 419, '05.)

t°.	Grams of $\text{NH}_4\text{NO}_3$ Dissolved per 100 Grams Aq. Alcohol of (Wt. %).					
	100%.	86.77%.	76.12%.	51.65%.	25.81%.	0%.
20	2.5	11.0	23.0	70.0	140	195
30	4.0	14.0	32.0	90.0	165	230
40	5.0	18.0	43.0	115.0	196	277
50	6.0	24.0	55.0	144.0	244	365
60	7.5	30.0	70.0	183.0	320	...
70	9.0	41.0	93.0	230.0	...	...
80	10.5	56.0	...	...	...	...

NOTE. — The figures in the preceding table were read from curves shown in the abridged report of the work, and are therefore only approximately correct. Determinations of the solubility in methyl alcohol solutions were also made but not quoted in the abstract. The "Synthetic Method" (see Note, page 9) was used.

100 grams absolute ethyl alcohol dissolve 4.6 grams  $\text{NH}_4\text{NO}_3$  at 14° and 3.8 grams at 20.5°.

100 grams absolute methyl alcohol dissolve 14.6 grams  $\text{NH}_4\text{NO}_3$  at 14° and 17.1 grams at 20.5°.

(Schiff and Monssacchi — *Z. physik. Chem.* 21, 277, '96; at 20.5° de Bruyn — *Ibid.*, 10, 783, '92.)

## AMMONIUM MAGNESIUM NITRATE $2\text{NH}_4\text{NO}_3 \cdot \text{Mg}(\text{NO}_3)_2$ .

100 parts water dissolve 10 parts salt at 12.5°.

(Foucault.)

## AMMONIUM MANGANIC MOLYBDATE $5(\text{NH}_4)_2\text{MoO}_4 \cdot \text{Mn}_2(\text{Mo}_2\text{O}_7)_2 \cdot 12\text{H}_2\text{O}$ .

100 parts water dissolve 0.98 parts salt at 17°.

(Struve — *J. pr. Chem.* 61, 460, '54.)

## AMMONIUM OXALATE $(\text{NH}_4)_2\text{C}_2\text{O}_4$ .

100 grams  $\text{H}_2\text{O}$  dissolve 2.215 grams  $(\text{NH}_4)_2\text{C}_2\text{O}_4$  at 0° Sp. Gr. of solution = 1.0105.

(Engel — *Ann. chim. phys.* [6] 13, 359, '88.)

## SOLUBILITY OF NEUTRAL AMMONIUM OXALATE IN AQUEOUS SOLUTIONS OF ACID AMMONIUM OXALATE.

(Engel.)

‡ Milligram Mols. per 10 cc. Solution.		Grams per 100 cc. Solution.	
$(\text{NH}_4)_2\text{C}_2\text{O}_4$	$\text{NH}_4\text{HC}_2\text{O}_4$	$(\text{NH}_4)_2\text{C}_2\text{O}_4$	$\text{NH}_4\text{HC}_2\text{O}_4$
3.54	0.0	2.19	0.0
2.65	1.45	1.63	0.77
2.475	2.525	1.52	1.34
2.38	2.90	1.47	1.54*

\* Both salts present in solid phase

**SOLUBILITY OF AMMONIUM OXALATE AND OXALIC ACID IN WATER AT 25°.**  
(Walden — Am. Ch. J. 34, 149, '05.)

Mixtures of the two substances were dissolved in warm water and the solutions allowed to cool in a thermostadt held at 25°.

Composition of Solution.				Solid Phase.
Grams per 100 Gms. Solution.		Mols. per 100 Mols. H <sub>2</sub> O.		
(NH <sub>4</sub> ) <sub>2</sub> C <sub>2</sub> O <sub>4</sub> . H <sub>2</sub> C <sub>2</sub> O <sub>4</sub> .		(NH <sub>4</sub> ) <sub>2</sub> C <sub>2</sub> O <sub>4</sub> . H <sub>2</sub> C <sub>2</sub> O <sub>4</sub> .		
0.28	10.20	0.045	2.281	H <sub>2</sub> C <sub>2</sub> O <sub>4</sub> .2H <sub>2</sub> O and (NH <sub>4</sub> ) <sub>2</sub> C <sub>2</sub> O <sub>4</sub> .3H <sub>2</sub> C <sub>2</sub> O <sub>4</sub> .4H <sub>2</sub> O
0.46	7.24	0.072	1.570	
2.44	2.59	0.372	0.546	Double salt, (NH <sub>4</sub> ) <sub>2</sub> C <sub>2</sub> O <sub>4</sub> .3H <sub>2</sub> C <sub>2</sub> O <sub>4</sub> .4H <sub>2</sub> O
3.65	2.80	0.566	0.599	
4.99	3.41	0.791	0.745	(NH <sub>4</sub> ) <sub>2</sub> C <sub>2</sub> O <sub>4</sub> .3H <sub>2</sub> C <sub>2</sub> O <sub>4</sub> .4H <sub>2</sub> O and (NH <sub>4</sub> ) <sub>2</sub> C <sub>2</sub> O <sub>4</sub> .H <sub>2</sub> C <sub>2</sub> O <sub>4</sub> .H <sub>2</sub> O
5.20	3.55	0.824	0.781	
5.36	3.38	0.853	0.741	Double salt, (NH <sub>4</sub> ) <sub>2</sub> C <sub>2</sub> O <sub>4</sub> .H <sub>2</sub> C <sub>2</sub> O <sub>4</sub> .H <sub>2</sub> O
6.27	3.04	1.00	0.671	
7.03	2.90	1.13	0.645	(NH <sub>4</sub> ) <sub>2</sub> C <sub>2</sub> O <sub>4</sub> .H <sub>2</sub> C <sub>2</sub> O <sub>4</sub> .H <sub>2</sub> O and (NH <sub>4</sub> ) <sub>2</sub> C <sub>2</sub> O <sub>4</sub>
7.08	2.70	1.14	0.599	
6.92	...	0.775	...	(NH <sub>4</sub> ) <sub>2</sub> C <sub>2</sub> O <sub>4</sub>

**AMMONIUM HYDROGEN PHOSPHITE (NH<sub>4</sub>H)HPO<sub>3</sub>.**

100 grams water dissolve 171 grams (NH<sub>4</sub>H)HPO<sub>3</sub> at 0°, 190 grams at 14.5° and 260 grams at 31°.

(Amat. — Compt. rend. 105, 809, '87.)

**AMMONIUM PERMANGANATE NH<sub>4</sub>MnO<sub>4</sub>.**

100 parts water dissolve approximately 8 parts of NH<sub>4</sub>MnO<sub>4</sub> at 15°.

(Aschoff.)

**AMMONIUM FLUO SILICATE (NH<sub>4</sub>)<sub>2</sub>SiF<sub>6</sub>.**

100 parts water dissolve 18.5 parts (NH<sub>4</sub>)<sub>2</sub>SiF<sub>6</sub> at 17.5°, Sp. Gr. 1.096.

(Stolba — Chem. Centr. 418, 1877.)

**AMMONIUM SALICYLATE C<sub>6</sub>H<sub>4</sub>(OH)COONH<sub>4</sub>.**

100 parts H<sub>2</sub>O dissolve 111.1 parts C<sub>6</sub>H<sub>4</sub>(OH)COONH<sub>4</sub> at 25°; 100 parts alcohol dissolve 43.5 parts at 25° and 100 parts at the b. pt. (U. S. P.)

**AMMONIUM SULPHATE (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>.**

**SOLUBILITY IN WATER.**

(Mulder.)

t°.	Grams (NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub> per 100 Grams.		t°.	Grams (NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub> per 100 Grams.	
	Water.	Solution.		Water.	Solution.
0	70.6	41.4	30	78.0	43.8
5	71.8	41.8	40	81.0	44.8
10	73.0	42.2	60	88.0	46.8
15	74.2	42.6	80	95.3	48.8
20	75.4	43.0	100	103.3	50.8
25	76.7	43.4	108.9	107.5	51.8

Sp. Gr. of saturated solution at 15° = 1.248; at 19° = 1.241.

# AMMONIUM SULPHATE

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## SOLUBILITY OF MIXTURES OF AMMONIUM SULPHATE AND COPPER SULPHATE AT 16°, AND OF AMMONIUM SULPHATE AND POTASSIUM SULPHATE AT 19.1°.

(Rüdorff — Ber. 6, 482, '73.)

(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub> + CuSO <sub>4</sub> .			(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub> + K <sub>2</sub> SO <sub>4</sub> .		
Preparation of Solution.	G. per 100 g. Solution.		Preparation of Solution.	G. per 100 g. Solution.	
	CuSO <sub>4</sub>	(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub>		K <sub>2</sub> SO <sub>4</sub>	(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub>
Both salts in excess	8.55	7.12	Both salts in excess	39.3	37.97
15 cc. sat. sol. + 3 gms. (NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub>	1.77	18.16	15 cc. sat. sol. + 4 g. K <sub>2</sub> SO <sub>4</sub>	4.94	33.26
15 cc. sat. sol. + 3 gms. CuSO <sub>4</sub> ·5H <sub>2</sub> O	15.85	5.65	15 cc. sat. sol. + 4 g. (NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub>	2.05	40.80

## SOLUBILITY OF AMMONIUM SULPHATE IN AQUEOUS ETHYL ALCOHOL SOLUTIONS.

(Traube and Neuberg — Z. physik. Chem. 1, 510, '87; Bodländer — *Ibid.* 7, 318, '91; Schreinemaker — *Ibid.* 23, 657, '97; de Bruyn — *Ibid.* 32, 68, '00; Linebarger — Am. Ch. J. 14, 380, '92.)

Upper Layer Results.		Lower Layer Results.			
Grams per 100 Gms. Solution at 10°-40°.		Gms. C <sub>2</sub> H <sub>5</sub> OH per 100 Gms. Solution.	Gms. (NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub> per 100 g. Solution at:		
C <sub>2</sub> H <sub>5</sub> OH.	(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub> .		6.5°.	15°.	33°.
100	0.0	0	42.0	42.6	44
80	0.1	2.5	39.0	40.2	?
70	0.3	5.0	36.2	37.2	?
60	1.4	7.5	33.2	34.5	42
50	3.2	10.0	30.0	31.0	35
45	4.8	12.5	27.2	28.0	?
40	6.6	15.0	24.6	25.2	?
35	9.2	17.5	22.0	22.4	?
30	12.2	20.0	20.0	20.0	?
25	14.6				

NOTE. — When ammonium sulphate is added to aqueous solutions of alcohol, it is found that for certain concentrations and temperatures the solutions separate into two liquid layers, the upper of which contains the larger percentage of alcohol.

Most of the determinations which have been made upon this system, as contained in the papers referred to above, are given in terms of grams of ammonium sulphate, of alcohol and of water per 100 grams of these three components taken together. Those results which are given in other terms can be readily calculated to this basis, and it is therefore possible to make a comparison of the several sets of determinations by plotting on cross-section paper and drawing curves through the points. In the present case the grams of alcohol per 100 grams of solution were taken as ordinates, and the grams of ammonium sulphate in the same quantity of each solution taken as abscissæ. It was found that a single curve could be drawn through practically all the points representing the upper layer solutions at the several temperatures, but the points for the solutions containing the larger amounts of water gave curves which diverged with increase of temperature. The results given for 33° in the above table are not to be accepted as correct until further work has been done.

**SOLUBILITY OF AMMONIUM SULPHATE IN AQUEOUS PROPYL ALCOHOL SOLUTIONS AT 20°.**

(Linebarger — Am. Ch. J. 14, 380, '92.)

Gms. per 100 Gms. Solution.		Gms. per 100 Gms. Solution.	
$C_3H_7OH.$	$(NH_4)_2SO_4.$	$C_3H_7OH.$	$(NH_4)_2SO_4.$
70	0.4	40	3.2
60	1.0	30	4.8
50	2.0	20	6.7

**AMMONIUM CADMIUM SULPHATE**  $(NH_4)_2Cd(SO_4) \cdot 6H_2O.$ 100 cc.  $H_2C$  dissolve 72.3 grams  $(NH_4)_2Cd(SO_4)_2$  at 25°.  
(Locke — Am. Ch. J. 27, 459, '01.)**AMMONIUM CHROMIUM SULPHATE** (Alum)  $(NH_4)_2Cr_2(SO_4)_4 \cdot 24H_2O.$ 100 cc.  $H_2O$  dissolve 10.78 grams anhydrous or 21.21 grams hydrated salt at 25°.

(Locke — Am. Ch. J. 26, 174, '01.)

**AMMONIUM COBALT SULPHATE**  $(NH_4)_2Co(SO_4)_2 \cdot 6H_2O.$ **SOLUBILITY IN WATER.**

(Tobler — Liebig's Annalen 95, 193, '55; v. Hauer — J. pr. Chem. 74, 433, '58; at 25°, Locke — Am. Ch. J. 27, 459, '01.)

t°.	Gms. $(NH_4)_2Co(SO_4)_2$ per 100 Gms.		t°.	Gms. $(NH_4)_2Co(SO_4)_2$ per 100 Gms.	
	Water.	Solution.		Water.	Solution.
0	6.0	5.7	40	22.0	18.0
10	9.5	8.7	50	27.0	21.3
20	13.0	11.5	60	33.5	25.1
25	14.72	12.8	70	40.0	28.6
30	17.0	14.5	80	49.0	32.9

NOTE. — The determinations reported by the above named investigators were plotted on cross-section paper and although considerable variations were noted, an average curve which probably represents very nearly the true conditions was drawn through them, and the above table made from this curve.

**AMMONIUM COPPER SULPHATE**  $(NH_4)_2Cu(SO_4)_2 \cdot 6H_2O.$ 100 grams  $H_2O$  dissolve 26.6 grams salt at 19°, Sp. Gr. of sol. = 1.1336  
(Schiff — Liebig's Ann. 109, 326, '59.)**AMMONIUM IRON SULPHATE** (Alum)  $(NH_4)_2Fe_2(SO_4)_4 \cdot 24H_2O.$ 100 cc.  $H_2O$  dissolve 44.15 gms. anhydrous or 124.40 gms. hydrated salt at 25°. Sp. Gr. of saturated solution at 15° = 1.203.

(Locke — Am. Ch. J. 26, 174, '01.)

**AMMONIUM IRON SULPHATE** (ferrous)  $(NH_4)_2Fe(SO_4)_2 \cdot 6H_2O.$ **SOLUBILITY IN WATER.**

(Tobler; at 25°, Locke — Am. Ch. J. 27, 459, '01.)

t°.	G. $(NH_4)_2Fe(SO_4)_2$ per 100 g. $H_2O.$	t°.	G. $(NH_4)_2Fe(SO_4)_2$ per 100 g. $H_2O.$	t°.	G. $(NH_4)_2Fe(SO_4)_2$ per 100 g. $H_2O.$
0	12.5	25	25.0 (T)	50	40
15	20.0	25	35.1 (L)	70	52
		40	33.0		

**AMMONIUM INDIUM  
SULPHATE**

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**AMMONIUM INDIUM SULPHATE**  $(\text{NH}_4)_2\text{In}_2(\text{SO}_4)_4 \cdot 24\text{H}_2\text{O}$ .

100 g.  $\text{H}_2\text{O}$  dissolve 200 gms. salt at  $16^\circ$  and 400 gms. at  $30^\circ$ .

(Rössler — J. pr. Chem. [2] 7, 14, '73.)

**AMMONIUM MAGNESIUM SULPHATE**  $(\text{NH}_4)_2\text{Mg}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$ .

**SOLUBILITY IN WATER.**

(Average curve, from results of Mulder, Tobler, Locke, at  $25^\circ$ .)

t°.	G. $(\text{NH}_4)_2\text{Mg}(\text{SO}_4)_2$ per 100 Gms.		t°.	G. $(\text{NH}_4)_2\text{Mg}(\text{SO}_4)_2$ per 100 Gms.	
	Water.	Solution.		Water.	Solution.
0	9.0	8.8	40	27.0	21.3
10	13.0	11.5	50	32.0	24.4
20	18.0	15.3	60	37.0	27.0
25	19.9	16.6	70	42.0	29.6
30	22.0	18.0	80	47.0	32.0

**AMMONIUM MANGANESE SULPHATE**  $(\text{NH}_4)_2\text{Mn}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$ .

100 cc. water dissolve 37.2 gms.  $(\text{NH}_4)_2\text{Mn}(\text{SO}_4)_2$  at  $25^\circ$ .

(Locke — Am. Ch. J. 27, 459, '01.)

**AMMONIUM NICKEL SULPHATE**  $(\text{NH}_4)_2\text{Ni}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$ .

**SOLUBILITY IN WATER.**

(Average curve from Tobler, Locke, at  $25^\circ$ .)

t°.	G. $(\text{NH}_4)_2\text{Ni}(\text{SO}_4)_2$ per 100 Gms.		t°.	G. $(\text{NH}_4)_2\text{Ni}(\text{SO}_4)_2$ per 100 Gms.	
	Water.	Solution.		Water.	Solution.
0	1.0	0.99	40	12.0	10.72
10	4.0	3.85	50	14.5	12.96
20	6.5	6.10	60	17.0	14.53
25	7.57	7.04	70	20.0	16.66
30	9.0	8.45			

**AMMONIUM SODIUM SULPHATE**  $\text{NH}_4\text{NaSO}_4 \cdot 2\text{H}_2\text{O}$ .

100 gms. water dissolve 46.6 gms.  $\text{NH}_4\text{NaSO}_4 \cdot 2\text{H}_2\text{O}$  at  $15^\circ$ , Sp. Gr. Sol. = 1.1749.

**AMMONIUM VANADIUM SULPHATE** (Alum)  $(\text{NH}_4)_2\text{V}_2(\text{SO}_4)_4 \cdot 24\text{H}_2\text{O}$ .

100 cc.  $\text{H}_2\text{O}$  dissolve 31.69 gms. anhydrous or 78.50 gms. hydrated salt at  $25^\circ$ .

(Locke.)

**AMMONIUM ZINC SULPHATE**  $(\text{NH}_4)_2\text{Zn}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$ .

**SOLUBILITY IN WATER.**

(Average curve, see Note, p. 33, Tobler, Locke, at  $25^\circ$ .)

t°.	G. $(\text{NH}_4)_2\text{Zn}(\text{SO}_4)_2$ per 100 Gms.		t°.	G. $(\text{NH}_4)_2\text{Zn}(\text{SO}_4)_2$ per 100 Gms.	
	Solution.	Water.		Solution.	Water.
0	6.54	7.0	40	16.66	20
10	8.67	9.5	50	20.0	25
20	11.11	12.5	60	23.1	30
25	12.36	14.1	70	25.9	35
30	13.79	16.0	80	29.6	42

### 35 AMMONIUM PERSULPHATE

#### AMMONIUM PERSULPHATE $(\text{NH}_4)_2\text{S}_2\text{O}_8$ .

100 parts  $\text{H}_2\text{O}$  dissolve 58.2 parts  $(\text{NH}_4)_2\text{S}_2\text{O}_8$  at  $0^\circ$ .

(Marshall — J. Chem. Soc. 59, 771, '91.)

#### AMMONIUM SODIUM HYDROGEN SULPHITE $(\text{NH}_4)\text{Na}_2\text{H}(\text{SO}_3)_2$ $4\text{H}_2\text{O}$ .

100 gms.  $\text{H}_2\text{O}$  dissolve 42.3 gms. salt at  $12.4^\circ$  and 48.5° gms. at  $15^\circ$ .

(Schwinker — Ber. 22, 1732, '89.)

#### AMMONIUM SULPHOCYANIDE $\text{NH}_4\text{SCN}$ .

100 parts water dissolve 128.1 parts  $\text{NH}_4\text{SCN}$  at  $0^\circ$  and 162.2 parts at  $20^\circ$ .

(Clowes — Z. Ch. 190, 1866.)

#### AMYL ACETATE BUTYRATE, FORMATE, etc.

##### SOLUBILITY IN WATER AND IN AQUEOUS ALCOHOL AT $20^\circ$ .

(Bancroft — Phys. Rev. 3, 131, 1906, 205, '95-'96; Traube. — Ber. 17, 2304, '84.)

Ester.	cc. Ester per 100 cc. $\text{H}_2\text{O}$ .	Sp. Gr. of Ester.	Ester.	cc. Ester per 100 cc. $\text{H}_2\text{O}$ .	Sp. Gr. of Ester.
Amyl acetate	0.2	0.88	Amyl propionate	0.1	0.88
Iso amyl acetate	0.2 (1.2?)	...	Iso amyl formate	0.3 (gms. at $22^\circ$ )	
Amyl butyrate	0.06	0.85			

##### Solubility of Iso Amyl Acetate in Aq. Alcohol Mixtures.      Solubility of Amyl Acetate and Amyl Formate in Aq. Alcohol Mixtures.

Per 5 cc. $\text{C}_2\text{H}_5\text{OH}$ .		cc. $\text{C}_2\text{H}_5\text{OH}$ in Mixture.	cc. $\text{H}_2\text{O}$ added to cause separation of second phase in mixtures of the given amounts of alcohol and 3 cc. portions of:	
cc. $\text{H}_2\text{O}$ .	cc. Iso Amyl acetate.		Amyl Formate.	Amyl Acetate.
7	0.41	3	1.80	1.76
6	9.7	9	8.77	9.03
5	1.31	15	17.01	17.52
3.61	3.0	21	27.06	26.99
3.01	4.0	27	38.31	37.23
2.60	5.0	33	50.71	48.41
		39	65.21	...
		45	85.10	...
		48	94.20	...

#### ANETHOL (p Propylanisol) $\text{CH}_3\text{CHCH}[\text{4}]\text{C}_6\text{H}_4\text{OCH}_3$ .

##### SOLUBILITY IN Aq. ALCOHOL AT $20^\circ$ .

(Schimmel and Co. Reports, Oct 1895, p. 6.)

Vol. per cent alcohol =	20	25	30	40	50
Gm. Anethol per liter aq. alcohol =	0.12	0.20	0.32	0.86	2.30



## ANILINE

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ANILINE  $C_6H_5(NH_2)$ .

## SOLUBILITY IN WATER AT 22°.

(Herz — Ber. 31, 2671, '98; see also Vaubel — J. pr. Chem. [2] 52, 72, '95; Aignan and Dugas — Compt. rend. 129, 643, 99.)

100 cc.  $H_2O$  dissolve 3.481 cc.  $C_6H_5(NH_2)$  — Vol. of Sol. = 103.48, Sp. Gr. = 0.9986.100 cc.  $C_6H_5(NH_2)$  dissolve 5.22 cc.  $H_2O$  — Vol. of Sol. = 104.96, Sp. Gr. = 1.0175.

## SOLUBILITY OF ANILINE IN WATER AT DIFFERENT TEMPERATURES.

(Alexejew — Ann. Physik. Chem. 28, 305, '86; calc. by Rothmund — Z. physik. Chem. 26, 475, '98.) Determinations by "Synthetic Method" see Note, p. 9. Figures read from curve.

t°.	Gms. $C_6H_5(NH_2)$ per 100 Grams.		t°.	Gms. $C_6H_5NH_2$ per 100 Grams.	
	Aq. Layer.	Aniline Layer.		Aq. Layer.	Aniline Layer.
20	3.2	95.5	140	13.0	83.5
40	3.5	95.0	150	18.0	79.0
60	3.8	94.7	160	27.5	71.0
80	4.5	93.5	165	36.0	63.0
100	6.0	92.0	167.5 (crit. temp.)	48.6	
120	8.5	88.5			

## SOLUBILITY OF ANILINE IN AQUEOUS SALT SOLUTIONS AT 18°.

(Euler — Z. physik. Chem. 49, 307, '04.)

Aq. Solution.	Gms. Salt per liter.	Gms. $C_6H_5(NH_2)$ per 100 g. solvent.	Aq. Solution.	Gms. Salt per liter.	Gms. $C_6H_5NH_2$ per 100 g. solvent.
$H_2O$ alone	0	3.61	N NaOH	40.06	1.90
$\frac{1}{2}$ N KCl	37.3	3.15	N LiCl	42.48	2.80
N KCl	74.6	2.68	N $CuCl_2$	67.25	3.00
N NaCl	58.5	2.55			

## SOLUBILITY OF ANILINE IN AQUEOUS ANILINE HYDROCHLORIDE

## SOLUTIONS AT 18°.

(Lidow — J. russ. phys. chem. Ges. 15, 420, '83; Ber. 16, 2207, '83.)

Per cent $C_6H_5NH_2HCl$ in Solvent	Gms. $C_6H_5NH_2$ per 100 g. Solvent.	Per cent $C_6H_5NH_2HCl$ in Solvent.	Gms. $C_6H_5NH_2$ per 100 g. Solvent.
5	3.8	30	39.2
12	5.3	35	50.4
25	18.3		

## DISTRIBUTION OF ANILINE BETWEEN:

(Vaubel — J. pr. Chem. [2] 67, 477, '03.)

Water and Ether.				Water and Carbon Tetrachloride.			
Composition of Solutions.		Gms. $C_6H_5NH_2$ in:		Composition of Solutions.		Gms. $C_6H_5NH_2$ in:	
G. $C_6H_5NH_2$ Used.	Solvent.	Aq. Layer.	Ether Layer.	G. $C_6H_5NH_2$ Used.	Solvent.	Aq. Layer.	$CCl_4$ Layer.
1.2478	50 cc. $H_2O$				50 cc. $H_2O$		
	+ 20 cc. Ether	0.1671	1.0807	0.3478	+ 20 cc. $CCl_4$	0.3358	0.012
1.2478	50 cc. $H_2O$				50 cc. $H_2O$		
	+ 50 cc. Ether	0.0835	1.1643	1.2478	+ 50 cc. $CCl_4$	0.2767	1.971
1.2478	50 cc. $H_2O$				50 cc. $H_2O$		
	+ 100 cc. Ether	0.0594	1.1884	1.2478	+ 100 cc. $CCl_4$	0.1845	1.063

## SOLUBILITY OF ANILINE IN SULPHUR.

(Alexejew — Ann. Physik. Chem. 28, 305, '86.)

t°.	Gms. $C_6H_5NH_2$ per 100 g.		t°.	Gms. $C_6H_5NH_2$ per 100 g.	
	S. Layer.	Anilin Layer.		S. Layer.	Anilin Layer.
100	4	75	130	15	58
110	6	70	135	17.5	47
120	10	64	138 (crit. temp.)	23	..

**DISTRIBUTION OF ANILINE BETWEEN WATER AND TOLUENE AND  
BETWEEN AQUEOUS SALT SOLUTIONS AND TOLUENE AT 25°**

(Riccioli — Z. physik. Chem. 56, 243, '06.)

NOTE. — Mixtures of Aniline and Toluene were shaken with water or with aqueous salt solutions, and after separation of the two layers the Sp. Gr. of the A : T mixture (layer) was determined and also the amount of Aniline in each layer.

Solution Shaken with A : T Mixture.	Vol. per cent Aniline : Toluene in Mixtures Used.	Sp. Gr. of A : T Mixture after Separation.	Gms. $C_6H_5NH_2$ in 100 cc. of:	
			A : T Layer.	Aq. Layer.
$H_2O$	50:50	0.9257	41.5	2.14
"	25:75	0.8928	20.7	1.5
"	12.5:87.5	0.8737	8.62	0.86
"	5.5:94.5	0.8661	3.87	0.45
"	2.5:97.5	0.8627	1.68	0.21
0.1N $\frac{K_2SO_4}{2}$	50:50	0.9297	44.0	2.09
"	25:75	0.8901	19.03	1.38
"	12.5:87.5	0.8739	8.77	0.81
"	5.5:94.5	0.8663	3.94	0.42
"	2.5:97.5	0.8629	1.81	0.21
0.1N $KBO_3$	50:50	0.9257	41.61	2.11
"	25:75	0.8870	17.08	1.34
"	12.5:87.5	0.8748	9.34	0.92
"	5.5:94.5	0.8661	3.85	0.44
"	2.5:97.5	0.8627	1.72	0.21
0.01094N $\frac{Ba(OH)_2}{2}$	50:50	0.9334	46.52	2.10
"	25:75	0.8929	20.78	1.46
"	12.5:87.5	0.8749	9.41	0.88
"	5.5:94.5	0.8663	3.96	0.43
"	2.5:97.5	0.8628	1.72	0.20
0.104N $\frac{Sr(OH)_2}{2}$	50:50	0.9333	46.45	2.13
"	25:75	0.8929	20.78	1.46
0.1044N $\frac{Sr(OH)_2}{2}$	12.5:87.5	0.8750	9.46	0.88
"	5.5:94.5	0.8662	3.96	0.43
0.1063N $\frac{Sr(OH)_2}{2}$	2.5:97.5	0.8628	1.75	0.20
0.04N $\frac{Ca(OH)_2}{2}$	50:50	0.9333	46.18	2.20
"	25:75	0.8925	20.59	1.51
"	12.5:87.5	0.8749	9.43	0.91
"	5.5:94.5	0.8662	3.89	0.44
"	2.5:97.5	0.8627	1.70	0.21

100 cc. aqueous solution contain 3.607 gms. Aniline at 25°.

## SOLUBILITY OF ANILINE, PHENOL MIXTURES IN WATER.

(Schreinemaker — Z. physik. Chem. 29, 584; 30, 460, '90.)

t°.	Mixture used = 25.4 Mols. Aniline + 74.6 Mols. Phenol Gms. of Mixture per 100 Gms.		t°.	Mixture used = 50 Mols. Aniline + 50 Mols. Phenol Gms. of Mixture per 100 Gms.	
	Aq. Layer.	A. + P. Layer.		Aq. Layer.	A. + P. Layer.
40	5.0	86.0	40	4.0	91.5
60	5.5	82.0	80	5.5	85.5
80	8.0	77.0	100	8.0	82.0
100	12.5	67.0	120	13.5	73.5
110	19.0	56.5	130	19.0	66.0
104 (crit. temp.)	33	...	135	23.5	58.0
			140 (crit. temp.)	35	...

Determinations in above table by "Synthetic Method," see NOTE, p. 9. Schreinemaker gives results for several other mixtures of Aniline and Phenol which yield curves entirely similar to those for the two mixtures here shown.

NITRANILINES  $C_6H_5NH_2NO_2$ , *o*, *m*, and *p*.

## SOLUBILITY IN WATER.

(Carnelly and Thomson — J. Chem. Soc. 53, 768, '88; Vaubel — J. pr. Chem. [2] 52, 73, '95; above 80°, Löwenherz — Z. physik. Chem. 25, 407, '98.)

t°.	Grams Nitraniline per Liter of Solution.		
	Ortho Nitraniline.	Meta Nitraniline.	Para Nitraniline.
20	...	1.14-1.67	0.77-0.80
24.2	1.25 (25°)	1.205	...
27.3	...	1.422	...

## SOLUBILITY OF ORTHO AND OF META NITRANILINE IN HYDROCHLORIC ACID.

(Löwenherz.)

Ortho Nitraniline at 25°.				Meta Nitraniline.			
G. Mols. per Liter.		Grams per Liter.		G. Mols. per Liter.		Grams per Liter.	
HCl	$C_6H_5NH_2$ $NO_2(o)$	HCl	$C_6H_5NH_2$ $NO_2(o)$	HCl	$C_6H_5NH_2$ $NO_2(m)$	HCl	$C_6H_5NH_2$ $NO_2(m)$
0.0	0.0091	0.0	1.25 (25°)	0.0	0.0091	0.0	1.20
0.63	0.0143	22.97	1.97 (26.5°)	0.0125	0.0183	0.46	2.53
0.95	0.0174	34.63	2.40 (23.3°)	0.0247	0.0274	0.90	3.85
1.26	0.0215	45.94	2.97				

## SOLUBILITY OF META AND OF PARA NITRANILINE IN ORGANIC SOLVENTS AT 20°.

(Carnelly and Thomson.)

Solvent.	Gms. per Liter.		Solvent.	Gms. per Liter.	
	Meta.	Para.		Meta.	Para.
Methyl Alcohol	110.6	95.9	Benzene	24.5	19.8
Ethyl Alcohol	70.5	58.4	Toluene	17.1	13.1
Propyl Alcohol	56.5	43.5	Cumene	11.5	9.0
Iso Butyl Alcohol	26.4	19.1	Chloroform	30.1	23.1
Iso Amyl Alcohol	85.1	62.9	Carbon Tetra Chloride	2.1	1.7
Ethyl Ether	78.9	61.0	Carbon Bisulphide	3.3	2.6

ANISIC ACID (p-Methoxybenzoic acid)  $CH_3O.C_6H_4.COOH$ . See also p. 61.  
100 cc. sat. aq. solution contain 0.2263 gm. Anisic acid at 25°.

(Paul — Z. physik. Chem. 14, 111, '94.)

**ANTHRAcene**  $C_{14}H_{10}$ .**SOLUBILITY IN LIQUID SULPHUR DIOXIDE IN THE CRITICAL REGION.**

(Centnerswer and Teletow — Z. Electrochem. 9, 799, '03.)

Weighed amounts of anthracene and liquid  $SO_2$  were placed in glass tubes which were then sealed, rotated at a gradually increasing temperature and the point at which the solid disappeared, observed.

t°.	Gms. $C_{14}H_{10}$ per 100 g. Solution.	t°.	Gms. $C_{14}H_{10}$ per 100 g. Solution.	t°.	Gms. $C_{14}H_{10}$ per 100 g. Solution.
40.1	2.11	65.0	4.0	98.0	9.36
45.8	2.48	78.2	5.66	99.1	9.95
47.9	2.65	88.0	7.14	106.5	12.78

**SOLUBILITY OF ANTHRACENE IN ABSOLUTE ETHYL AND METHYL ALCOHOLS.**

(v. Becchi; at 19.5°, de Bruyn — Z. physik. Chem. 10, 784, '92.)

	Grams $C_{14}H_{10}$ per 100 Grams Alcohol at:		
	16°.	19.5°.	b. pt.
In Ethyl Alcohol	0.076	1.90	0.83
In Methyl Alcohol	...	1.80	...

**SOLUBILITY OF ANTHRACENE IN BENZENE.**

(Findlay — J. Chem. Soc. 81, 1221, '02.)

t°.	Gms. $C_{14}H_{10}$ per 100 Gms. $C_6H_6$ .	Mols. $C_{14}H_{10}$ per 100 Mols. $C_6H_6$ .	t°.	Gms. $C_{14}H_{10}$ per 100 Gms. $C_6H_6$ .	Mols. $C_{14}H_{10}$ per 100 Mols. $C_6H_6$ .
5	0.979	0.429	38.4	2.773	1.213
10	1.118	0.491	40.0	2.987	1.312
15	1.296	0.567	44.6	3.368	1.473
20	1.532	0.673	50	3.928	1.727
25	1.830	0.803	60	4.941	2.164
26.5	1.951	0.856	70	6.041	2.649
30	2.175	0.954	80	7.175	3.143

100 parts of toluene dissolve 0.92 parts anthracene at 16.5° and 12.94 parts at 100° (v. Becchi).

**SOLUBILITY OF ANTHRACENE IN ALCOHOLIC PICRIC ACID SOLUTIONS AT 25°.**

(Behrend — Z. physik. Chem. 15, 187, '94.)

Grams per 100 Grams Solution.		Solid Phase.	Grams per 100 Gms. Solution.		Solid Phase.
Picric Acid.	Anthracene.		Picric Acid.	Anthracene.	
0	0.176	Anthracene	3.999	0.202	Anthracene Picrate
1.017	0.190	"	5.087	0.180	"
2.071	0.206	"	5.843	0.162	"
2.673	0.215	"	6.727	0.151	"
3.233	0.228	"	7.511	0.149	Anthracene Picrate + Picric Acid
3.469	0.236	Anthracene and Anthracene Picrate	7.452	0	Picric Acid

**ANTHRAQUINONE**

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**ANTHRAQUINONE**  $(C_6H_4)_2(CO)_2$ .**SOLUBILITY IN LIQUID SULPHUR DIOXIDE IN THE CRITICAL REGION.**

(Centnerswer and Teletow — Z. Electrochem. 9, 799, '08.) (See Anthracene, page 39).

t°.	Gms. $C_{14}H_{10}O_2$ per 100 g. Solution.	t°.	Gms. $C_{14}H_{10}O_2$ per 100 g. Solution.	t°.	Gms. $C_{14}H_{10}O_2$ per 100 g. Solution.
39.6	0.64	92.1	2.81	118.5	5.60
51.5	0.88	101.4	3.67	141.6	7.53
67.9	1.73	106.3	4.23	160.0	9.60
82.4	2.24	108.7	4.40	179.0	12.70
				183.7	18.30

100 parts of absolute ethyl alcohol dissolve 0.05 part anthraquinone at 18° and 2.249 parts at b. pt. (v. Becchi).

**SOLUBILITY OF ANTHRAQUINONE IN ETHER.**

(Smits — Z. Electrochem. 9, 663, '03.)

Weighed amounts of ether and anthraquinone were placed in glass tubes which were then sealed. The temperature noted at which the anthraquinone disappeared and also at which the liquid phase disappeared (critical temp.). The two curves cross at 195° and again at 241°. Between these two temperatures the critical curve lies below the solubility curve, hence for this range of temperature no solubility curve is shown. The following figures were read from the curves, and are therefore only approximately correct.

t°.	Gms. $C_{14}H_{10}O_2$ per 100 g. Solution.	t°.	Gms. $C_{14}H_{10}O_2$ per 100 g. Solution.	t°.	Gms. $C_{14}H_{10}O_2$ per 100 g. Solution.
130	3	241	30	260	80
150	4	245	40	270	90
170	4.5	247	50	275	100
195	5.0	250	60		

100 parts of toluene dissolve 0.19 part anthraquinone at 15° and 5.56 parts at 100° (v. Becchi).

**ANTIMONY TRICHLORIDE**  $SbCl_3$ .**SOLUBILITY IN WATER. SOLID PHASE  $SbCl_3$ .**

(Meerburg — Z. anorg. Chem. 33, 299, 1903.)

t°.	Mols. $SbCl_3$ per 100 Mols. $H_2O$ .	Gms. $SbCl_3$ per 100 g. $H_2O$ .	t°.	Mols. $SbCl_3$ per 100 Mols. $H_2O$ .	Gms. $SbCl_3$ per 100 g. $H_2O$ .
0	47.9	601.6	35	91.6	1152.0
15	64.9	815.8	40	108.8	1368.0
20	{ 72.4	910.1	50	152.5	1917.0
	{ 74.1	931.5	60	360.4	4531.0
25	78.6	988.1	72	∞	∞
30	84.9	1068.0			

# 41 ANTIMONY TRICHLORIDE

## SOLUBILITY OF ANTIMONY TRICHLORIDE IN AQUEOUS HYDROCHLORIC ACID. SOLID PHASE $\text{SbCl}_3$ . TEMP. $20^\circ$ . (Meerburg.)

Mols. per 100 Mols. $\text{H}_2\text{O}$ .		Gms. per 100 g. $\text{H}_2\text{O}$ .		Mols. per 100 Mols. $\text{H}_2\text{O}$ .		Gms. per 100 g. $\text{H}_2\text{O}$ .	
HCl.	$\text{SbCl}_3$ .	HCl.	$\text{SbCl}_3$ .	HCl.	$\text{SbCl}_3$ .	HCl.	$\text{SbCl}_3$ .
0	72.4	0.0	910.1	9.1	68.9	18.41	866.4
2.4	71.2	4.86	895.4	11.7	68.1	23.68	856.3
6.1	69.9	12.34	879.0	28.7	62.8	58.08	789.8
8.3	68.2	16.80	857.6				

100 grams absolute acetone dissolve 537.6 grams  $\text{SbCl}_3$  at  $18^\circ$ .

(Naumann — Ber. 37, 4332, '04.)

## ANTIMONY TRI IODIDE $\text{SbI}_3$ .

### SOLUBILITY IN METHYLENE IODIDE AT $12^\circ$ .

(Retgers — Z. anorg. Ch. 3, 344, '93.)

100 parts  $\text{CH}_2\text{I}_2$  dissolve 11.3 parts  $\text{SbI}_3$ . Sp. Gr. of solution = 3.453.

## ANTIMONY POTASSIUM TARTRATE $\text{K}(\text{SbO})\text{C}_4\text{H}_4\text{O}_6 \cdot \frac{1}{2}\text{H}_2\text{O}$ .

100 grams glycerine dissolve 5.5 grams of the tartrate at  $15.5^\circ$ .

## ARGON, A.

### SOLUBILITY IN WATER.

(Estreicher — Z. physik. Chem. 31, 184, '99.)

$t^\circ$ .	Cor. Bar. Pressure.	Vol. $\text{H}_2\text{O}$ .	Vol. Absorbed Argon.	Absorption Coefficients.*		Solubility. g.
				a.	l.	
0	...	...	...	...	0.0578	0.0102
1	764.9	77.40	4.34	0.0561	0.0561	0.0099
5	765.0	77.39	3.92	0.0507	0.0508	0.0090
10	765.3	77.41	3.49	0.0450	0.0453	0.0079
15	762.4	77.46	3.13	0.0404	0.0410	0.0072
20	757.6	77.53	2.86	0.0369	0.0379	0.0066
25	766.7	77.62	2.64	0.0339	0.0347	0.0060
30	760.6	77.73	2.43	0.0312	0.0326	0.0056
35	757.1	77.86	2.24	0.0288	0.0305	0.0052
40	758.3	77.99	2.07	0.0265	0.0286	0.0048
45	756.4	78.15	1.92	0.0246	0.0273	0.0045
50	747.6	78.31	1.73	0.0221	0.0257	0.0041

a = under barometric pressure minus tension of  $\text{H}_2\text{O}$  vapor.

l = under 760 mm. pressure.

q = grams argon per 100 g.  $\text{H}_2\text{O}$  when total pressure is equal to 760 mm.

\* See Acetylene, page 8.

## ARSENIO PENTOXIDE $\text{As}_2\text{O}_5$ .

100 parts  $\text{H}_2\text{O}$  dissolve 244.8 parts  $\text{As}_2\text{O}_5$  = 302.3 parts  $\text{H}_3\text{AsO}_4$  at  $12.5^\circ$ . Sp. Gr. of solution = 2.18 at  $15^\circ$ .

(Vogel.)

## ARSENIO IODIDE $\text{AsI}_3$ .

### SOLUBILITY IN METHYLENE IODIDE AT $12^\circ$ .

(Retgers — Z. anorg. Chem. 3, 344, 1893.)

100 grams  $\text{CH}_2\text{I}_2$  dissolve 17.4 gms.  $\text{AsI}_3$ . Sp. Gr. of solution = 3.449.

# **ARSENIC TRIOXIDE**

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## **ARSENIC TRIOXIDE** $\text{As}_2\text{O}_3$ .

### SOLUBILITY OF THE:

#### Crystallized Modification. In Water.

t°.	Gms. $\text{As}_2\text{O}_3$ per 100 cc. Sat. Solution.
2	1.201
15	1.657
25	2.038
39.8	2.930
b. pt.	6. +

#### Amorphous Modification. In Water.

t°.	Gms. $\text{As}_2\text{O}_3$ per 100 cc. $\text{H}_2\text{O}$ .
ord. temp.	3.7
b. pt.	11.86
In Alcohol, Ether and $\text{CS}_2$ .	
	G. $\text{As}_2\text{O}_3$ per 100 g. Solvent.
Alcohol	0.446
Ether	0.454
$\text{CS}_2$	0.001

(Bruner and St. Tollocsko — Z. anorg. Chem. 37, 456, '03; Chodounsky — Lasy. Chem. 13, 114, '88.)

(Winkler — J. pr. Chem. [2] 31, 347, '85.)

## **ASPARAGINE** $\text{C}_4\text{H}_8\text{N}_2\text{O}_3 \cdot \text{H}_2\text{O}$ .

### SOLUBILITY $\beta$ -l-ASPARAGINE $\text{C}_4\text{H}_8\text{N}_2\text{O}_3 \cdot \text{H}_2\text{O}$ AND OF $\beta$ -l-ASPARAGINIC ACID $\text{C}_4\text{H}_7\text{NO}_4$ IN WATER.

Determined by "Synthetic Method," see Note, page 9.

(Bresler — Z. physik. Chem. 47, 613, '04.)

$\beta$ -l-Asparagine.				$\beta$ -l-Asparagic Acid.			
t°.	Gms. $\text{C}_4\text{H}_8\text{N}_2\text{O}_3 \cdot \text{H}_2\text{O}$ per 100 g. $\text{H}_2\text{O}$ .	t°.	Gms. $\text{C}_4\text{H}_8\text{N}_2\text{O}_3 \cdot \text{H}_2\text{O}$ per 100 g. $\text{H}_2\text{O}$ .	t°.	Gms. $\text{C}_4\text{H}_7\text{NO}_4$ per 100 g. $\text{H}_2\text{O}$ .	t°.	Gms. $\text{C}_4\text{H}_7\text{NO}_4$ per 100 g. $\text{H}_2\text{O}$ .
0.7	0.9546	55.5	10.650	0.2	0.2674	51.0	1.2746
7.9	1.4260	71.7	19.838	9.5	0.4042	63.5	1.8147
17.5	2.1400	87.0	36.564	16.4	0.5176	70.0	2.3500
28.0	3.1710	98.0	52.475	31.5	0.7514	80.5	3.2106
41.4	5.6500			40.0	0.9258	97.4	5.3746

## **ATROPINE** $\text{C}_{17}\text{H}_{23}\text{NO}_3$ .

### SOLUBILITY OF ATROPINE $\text{C}_{17}\text{H}_{23}\text{NO}_3$ AND OF ATROPINE SULPHATE $(\text{C}_{17}\text{H}_{23}\text{NO}_3)_2 \cdot \text{SO}_4(\text{OH})_2$ IN WATER AND OTHER SOLVENTS.

(U. S. P.; Müller — Apoth.-Ztg. 18, 244, '03.)

Solvent.	t°.	Grams Atropine per 100 Grams.		Grams Atropine Sulphate per 100 Grams Solvent. (U. S. P.)
		Solution.	Solvent. (U. S. P.)	
Water	25	1.782 (20°)	0.222	263.1
Water	80	...	1.15	454.5
Alcohol	25	...	68.44	27.0
Alcohol	60	...	111.11	52.6
Ether	25	2.21 (20°)	6.02	0.047
Chloroform	25	68.03 (20°)	64.10	0.161
Benzene	20	3.99	...	...
Carbon Tetrachloride	20	0.661	1.136* (17°)	...
Ethyl Acetate	20	3.88	...	...
Petroleum Ether	20	0.83	...	...
Glycerine	15	...	3.0	33.0

\* Schnidelmeyer — Chem. Ztg. 25, 129, '01.

**AZELAIC ACID**  $C_7H_{14}(COOH)_2$ .

## SOLUBILITY IN WATER.

(Lamoureux — Compt. rend. 128, 998, '99.)

$t^\circ =$	0	15	20	35	50	65
Gms. $C_7H_{14}(COOH)_2$ per 100 cc. solution =	0.10	0.15	0.24	0.45	0.82	2.20

**AZOPHENETOL** ( $p$ )  $C_6H_5N_2C_6H_4OC_2H_5$ .

## SOLUBILITY IN 100 PER CENT ACETIC ACID.

(Dreyer and Rotaraki — Chem. Centr. 76, II, 1016, '05.)

$t^\circ =$	89.2	91	93	95.6	97.2	99.6
Mols. per liter.	0.153	0.176	0.185	0.209	0.232	0.252

A knick at  $94.7^\circ$  corresponds to the transition temperature of the  $\alpha$  modification into the  $\beta$  modification.

**BARIUM ACETATE**  $Ba(CH_3COO)_2$ .

## SOLUBILITY IN WATER.

(Walker and Fyffe — J. Ch. Soc. 83, 179, '03; Krasnicki — Monatsh. Chem. 8, 597, '87.)

$t^\circ$ .	Gms. $Ba(CH_3COO)_2$ per 100 Gms.		Solid Phase.	$t^\circ$ .	Gms. $Ba(CH_3COO)_2$ per 100 Gms.		Solid Phase.
	Water.	Solution.			Water.	Solution.	
0.3	58.8	37.0	$Ba(C_2H_3O_2)_2 \cdot 3H_2O$	40.5	79.0	44.1	$Ba(C_2H_3O_2)_2$
7.9	61.6	38.1	"	41.5	78.7	44.0	"
17.5	69.2	40.9	"	44.5	77.9	43.8	"
21.6	72.8	42.1	"	51.8	76.5	43.4	"
24.1	78.1	43.9	"	63.0	74.6	42.7	"
26.2	76.4	43.3	$Ba(C_2H_3O_2)_2 \cdot H_2O$	73.0	73.5	42.4	"
30.6	75.1	42.9	"	84.0	74.0	42.5	"
35.0	75.8	43.1	"	99.2	74.8	42.8	"
39.6	77.9	43.8	"				

Transition temperatures  $24.7^\circ$  and  $41^\circ$ .

**BARIUM ARSENATE**  $Ba_3(AsO_4)_2$ .

100 gms.  $H_2O$  dissolve 0.055 gm.  $Ba_3(AsO_4)_2$ ; 100 gms. 5%  $NH_4Cl$  dissolve 0.195 gm., and 100 gms. 10%  $NH_4OH$  dissolve 0.003 gm.  $Ba_3(AsO_4)_2$ .

(Field — J. Ch. Soc. 11 6, 1859.)



# BARIUM BROMATE

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## BARIUM BROMATE $\text{BaBrO}_3 \cdot \text{H}_2\text{O}$ .

### SOLUBILITY IN WATER.

(Trants and Anschütz — Z. physik. Chem. 56, 238, '06; Rammelsberg — Pogg. Ann. 52, 81, '41.)

t°.	Gms. $\text{Ba}(\text{BrO}_3)_2$ per 100 Gms. Solution.	t°.	Gms. $\text{Ba}(\text{BrO}_3)_2$ per 100 Gms. Solution.	t°.	Gms. $\text{Ba}(\text{BrO}_3)_2$ per 100 Gms. Solution.
- 0.034	0.28	30	0.95	70	2.922
0	0.286	40	1.31	80	3.521
+10	0.439	50	1.72	90	4.26
20	0.652	60	2.271	98.7	5.256
25	0.788			99.65	5.39

## BARIUM BROMIDE $\text{BaBr}_2 \cdot 2\text{H}_2\text{O}$ .

### SOLUBILITY IN WATER.

(Kremers — Pogg. Ann. 99, 47, '56; Etard — Ann. chim. phys. [7] 2, 540, '94.)

Gms. $\text{BaBr}_2$ per 100 Grams.			Gms. $\text{BaBr}_2$ per 100 Grams.		
t°.	Water. (Kremers.)	Solution. (Kremers.) (Etard.)	t°.	Water. (Kremers.)	Solution. (Kremers.) (Etard.)
-20	...	...	40	114	53.2 51.5
0	98	49.5 47.5	50	118	54.1 52.5
10	101	50.2 48.5	60	123	55.1 53.5
20	104	51.0 49.5	70	128	56.1 54.5
25	106	51.4 50.0	80	135	57.4 55.5
30	109	52.1 50.6	100	149	60.0 57.8
			140	...	...
					59.4

Sp. Gr. of saturated solution at 19.5° = 1.710.

The results of Kremers and Etard are both given, since it is uncertain which is the more correct.

### SOLUBILITY OF MIXTURES OF BARIUM BROMIDE AND BARIUM IODIDE IN WATER AT DIFFERENT TEMPERATURES.

Grams per 100 Gms. Solution.			Grams per 100 Gms. Solution.		
t°.	$\text{BaBr}_2$ .	$\text{BaI}_2$ .	t°.	$\text{BaBr}_2$ .	$\text{BaI}_2$ .
-16	4.8	58.4	170	11.0	67.4
+60	5.5	66.0	210	14.9	67.7
135	9.2	67.2	Both salts present in solid phase.		

### SOLUBILITY OF BARIUM BROMIDE IN METHYL AND ETHYL ALCOHOLS.

(de Bruyn — Z. physik. Chem. 10, 783, 92; Richards — Z. anorg. Chem. 3, 455, '93; Rohland — *Ibid.* 15 412, '97.)

15 422 977

t°.	Parts BaBr <sub>2</sub> per 100 parts Aq. C <sub>2</sub> H <sub>5</sub> OH of:				Parts BaBr <sub>2</sub> ·2H <sub>2</sub> O per 100 parts of Aq. CH <sub>3</sub> OH of:		
	100%.	97%.	87%.		100%.	93.5%.	50%.
15.0	..	0.48 (BaBr <sub>2</sub> ·H <sub>2</sub> O)	..		45.9	27.3	4.0
22.5	3	...	6		56.1	...	...

## BARIUM BUTYRATE $\text{Ba}(\text{C}_4\text{H}_7\text{O}_2)_2 \cdot 2\text{H}_2\text{O}$ .

### SOLUBILITY IN WATER.

(Deszathay — Monatsch. Chem. 14, 249, '93.)

Gms. $\text{Ba}(\text{C}_4\text{H}_7\text{O}_2)_2$ per 100 Gms.			Gms. $\text{Ba}(\text{C}_4\text{H}_7\text{O}_2)_2$ per 100 Gms.		
t°.	Water.	Solution.	t°.	Water.	Solution.
0	37.42	27.24	50	36.44	26.77
10	36.65	26.82	60	37.68	27.36
20	36.12	26.55	70	39.58	28.36
30	35.85	26.38	80	42.13	29.64
40	35.82	26.37			

## BARIUM CAPROATE AND BARIUM ISO CAPROATE.

## SOLUBILITY IN WATER.

(Kulisch — Monatsh. Chem. 14, 567, '93.)

(König — Monatsh. Chem. 15, 23, '94.)

Barium Caproate (Methyl 3 Pentan.) Ba(CH <sub>2</sub> CH <sub>2</sub> CH(CH <sub>3</sub> )CH <sub>2</sub> COO) <sub>2</sub>				Barium Iso Caproate (Methyl 2 Pentan.) Ba(CH <sub>3</sub> CH(CH <sub>3</sub> )CH <sub>2</sub> CH <sub>2</sub> COO) <sub>2</sub>			
t°.	Gms. Ba(C <sub>6</sub> H <sub>11</sub> O <sub>2</sub> ) <sub>2</sub> per 100 Gms.		Solid Phase.	Gms. Ba(C <sub>6</sub> H <sub>11</sub> O <sub>2</sub> ) <sub>2</sub> per 100 Gms.		Solid Phase.	
	Water.	Solution.		Water.	Solution.		
0	11.71	10.49	Ba(C <sub>6</sub> H <sub>11</sub> O <sub>2</sub> ) <sub>2</sub> ·3½H <sub>2</sub> O	14.34	12.54	Ba(C <sub>6</sub> H <sub>11</sub> O <sub>2</sub> ) <sub>2</sub> ·4H <sub>2</sub> O	
10	8.38	7.73	"	13.33	11.77	"	
20	6.89	6.45	"	12.67	11.26	"	
30	5.87	5.55	"	12.37	11.01	"	
40	5.79	5.47	"	12.42	11.05	"	
50	6.63	6.21	"	12.83	11.38	"	
60	8.39	7.74	"	13.63	11.99	"	
70	11.09	9.98	"	14.68	12.80	"	
80	14.71	12.82	"	16.24	13.97	"	
90	19.28	16.16	"	17.95	15.23	"	

BARIUM CARBONATE  $\text{BaCO}_3$ .

## SOLUBILITY IN WATER.

(Holleman, Kohlrausch and Rose — Z. physik. Chem. 12, 129, 241, '93.)

Electrolytic conductivity method used.

1 liter  $\text{H}_2\text{O}$  dissolves 0.016 g.  $\text{BaCO}_3$  at  $8.8^\circ$ , 0.022 g. at  $18^\circ$ , and 0.024 g. at  $24.2^\circ$ .SOLUBILITY OF BARIUM CARBONATE IN WATER CONTAINING  $\text{CO}_2$ .

The average of several determinations at about  $10^\circ$ , by Bineau, Lassaigne, Foucroy and Bergmann is 1.10 gms.  $\text{BaCO}_3$  per liter water. Wagner (Z. anal. Ch. 6, 167, '67) gives 7.25 gms.  $\text{BaCO}_3$  per liter of water saturated with  $\text{CO}_2$  at 4-6 atmospheres pressure.

BARIUM CHLORATE  $\text{BaClO}_3 \cdot \text{H}_2\text{O}$ .

## SOLUBILITY IN WATER.

(Trantz and Anschütz — Z. physik. Chem. 56, 238, '06; Kremers — Pogg. Ann. 99, 43, '56; Tilden and Shenstone — Trans. Roy. Soc. 34, '84.)

t°.	Gms. $\text{Ba}(\text{ClO}_3)_2$ per 100 Gms. Solution.	t°.	Gms. $\text{Ba}(\text{ClO}_3)_2$ per 100 Gms. Solution.	t°.	Gms. $\text{Ba}(\text{ClO}_3)_2$ per 100 Gms. Solution.
- 2.75	15.28	30	29.43	90	48.70
0	16.90	40	33.16	99.1	51.17
+ 10	21.23	50	36.69	105	52.62
20	25.26	60	40.05	116	66.0
25	27.53	70	43.04	146	78.0
		80	45.90		

# BARIUM CHLORIDE

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## BARIUM CHLORIDE $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$ .

### SOLUBILITY IN WATER.

(Mukler; Engel — Ann. chim. phys. [6] 13, 372, '88; Etard — *Ibid.* [7] 2, 535, '94.)

t°.	Gms. $\text{BaCl}_2$ per 100 Gms.		t°.	Gms. $\text{BaCl}_2$ per 100 Gms.	
	Water.	Solution.		Water.	Solution.
0	31.6	24.0	60	46.4	31.3
10	33.3	25.0	70	49.4	33.1
20	35.7	26.3	80	52.4	34.4
25	37.0	27.0	100	58.8	37.0
30	38.2	27.7	130	59.5	37.3
40	40.7	28.9	160	63.6	38.9
50	43.6	30.4	215	75.9	43.1

Sp. Gr. of solution saturated at 0° = 1.25; at 20° = 1.27.

### SOLUBILITY OF MIXTURES OF BARIUM CHLORIDE AND BARIUM NITRATE IN WATER.

Both salts present in solid phase.

(Etard.)

t°.	Grams per 100 Gms. Solution.		t°.	Grams per 100 Gms. Solution.	
	$\text{BaCl}_2$ .	$\text{Ba}(\text{NO}_3)_2$ .		$\text{BaCl}_2$ .	$\text{Ba}(\text{NO}_3)_2$ .
0	22.5	4.3	100	31	14
20	24.5	6.0	140	32	20
40	26.5	7.5	180	33	26
60	28.5	9.5	210	32	32

### SOLUBILITY OF MIXTURES OF BARIUM CHLORIDE AND MERCURIC CHLORIDE IN WATER.

(Foote and Bristol — Am. Ch. J. 32, 248, '04.)

t°.	Gms. per 100 Gms. Solution.		Solid Phase.	t°.	Gms. per 100 Gms. Solution.		Solid Phase.
	$\text{BaCl}_2$ .	$\text{HgCl}_2$ .			$\text{BaCl}_2$ .	$\text{HgCl}_2$ .	
10.4	23.58	50.54	$\text{BaCl}_2 \cdot 2\text{H}_2\text{O} + \text{HgCl}_2$ .	10.4	22.10	51.66	Double Salt $\text{BaCl}_2 \cdot 3\text{HgCl}_2 \cdot 6\text{H}_2\text{O}$ .
10.4	23.44	50.74	Double Salt $\text{BaCl}_2 \cdot 3\text{HgCl}_2 \cdot 6\text{H}_2\text{O}$ .	10.4	21.64	51.74	$\text{BaCl}_2 \cdot 2\text{H}_2\text{O} + \text{HgCl}_2$ .
10.4	22.58	51.23		25	23.02	54.83	
10.4	22.48	51.41					

### SOLUBILITY OF MIXTURES OF BARIUM CHLORIDE AND POTASSIUM CHLORIDE IN WATER.

(Foote — Am. Ch. J. 32, 253, '04.)

100 grams saturated solution contain 13.83 grams  $\text{BaCl}_2$  + 18.97 grams KCl at 25°.

### SOLUBILITY OF MIXTURES OF BARIUM CHLORIDE AND SODIUM CHLORIDE IN WATER.

(Precht and Wittgen — Ber. 14, 1667, '81; Rüdorff — Ber. 18, 1161, '85.)

t°.	Gms. per 100 Gms. $\text{H}_2\text{O}$ .		Gms. per 100 Gms. Solution.	
	$\text{BaCl}_2$ .	$\text{NaCl}$ .	$\text{BaCl}_2$ .	$\text{NaCl}$ .
20	4.1	33.8	2.9	25.0
40	6.3	33.6	4.5	23.0
60	9.7	33.5	6.8	23.4
80	13.9	33.6	9.4	22.8
100	17.9	33.6	11.8	22.2

**SOLUBILITY OF BARIUM CHLORIDE IN AQUEOUS SOLUTIONS OF  
HYDROCHLORIC ACID AT 0°.**

(Engel — Ann. chim. phys. [6] 13, 371, '88.)

Sp. Gr. of Solutions.	Milligram Mols. per 10 cc. Sol.		Gms. per 100 cc. Sol.		Gms. per 100 g. Sol.	
	HCl.	$\frac{1}{2}$ BaCl <sub>2</sub> .	HCl.	BaCl <sub>2</sub> .	HCl.	BaCl <sub>2</sub> .
1.250	0	28.90	0	30.10	0	24.07
1.242	1.1	27.80	0.40	28.95	0.32	23.31
1.228	2.8	26.07	1.02	27.15	0.83	22.11
1.210	5.0	23.40	1.82	24.36	1.51	20.14
1.143	14.4	14.00	5.24	14.57	4.58	12.76
1.118	18.8	10.20	6.84	10.47	6.13	9.37
1.099	22.7	6.67	8.99	6.95	7.55	6.33
1.079	32.0	2.74	11.66	2.85	10.81	2.64
1.088	50.5	0.29	18.41	0.30	16.92	0.28

Less than 1 part of BaCl<sub>2</sub> is soluble in 20,000 parts of concentrated HCl and in 120,000 parts of conc. HCl containing  $\frac{1}{4}$  volume of ether.

(Mar — Am. J. Sci. [3] 43, 521, '92.)

**SOLUBILITY OF BARIUM CHLORIDE IN ABSOLUTE METHYL ALCOHOL  
AND IN GLYCERINE.**

(In Alcohol, de Bruyn — Z. physik. Chem. 10, 783, '92.)

100 parts of CH<sub>3</sub>OH dissolve 2.18 parts BaCl<sub>2</sub> at 15.5°, and 7.3 parts BaCl<sub>2</sub>.2H<sub>2</sub>O at 6°.

100 parts by weight of glycerine dissolve 10 parts of BaCl<sub>2</sub> at 15.5°.

**SOLUBILITY OF BARIUM CHLORIDE IN AQUEOUS ETHYL ALCOHOL AT 15°.**

(Schiff — Liebig's Ann. 118, 365, '61; Rohland — Z. anorg. Ch. 15, 412, '97.)

Wt. per cent alcohol	10	20	30	40	60	80	97
Gms. BaCl <sub>2</sub> .2H <sub>2</sub> O per							
100 g. aq. alcohol	31.1	21.9	14.7	10.2	3.5	0.5	0.014

**BARIUM CHROMATE BaCrO<sub>4</sub>.**

**SOLUBILITY IN WATER AND IN SALT SOLUTIONS.**

t°.	Solvent.	Gms. BaCrO <sub>4</sub> per Liter Solution.	Observer.
18	Water	0.0038	{ (Kohlrausch & Rose — Z. physik. Ch. 12, 241, '93.)
ord. temp.	"	0.0062 (ignited BaCrO <sub>4</sub> )	{ (Schweitzer — Z. anal. Ch. 29, 414, '90.)
ord. temp.	"	0.0100 (not ignited)	
b. pt.	"	0.043	{ (Mescherzski — Z. anal. Ch. 21, 399, '82.)
ord. temp.	1.5% Am. Acetate	0.020	{ (Fresenius — Z. anal. Ch. 29, 418, '90.)
ord. temp.	0.5% Am. Nitrate	0.022	

**BARIUM CITRATE Ba<sub>3</sub>(C<sub>6</sub>H<sub>5</sub>O<sub>7</sub>)<sub>2</sub>.7H<sub>2</sub>O.**

**SOLUBILITY IN WATER AND IN ALCOHOL.**

100 grams water dissolve 0.0406 gram Ba<sub>3</sub>(C<sub>6</sub>H<sub>5</sub>O<sub>7</sub>)<sub>2</sub>.7H<sub>2</sub>O at 18°, and 0.0572 gm. at 25°.

100 grams 95% alcohol dissolve 0.0044 gram Ba<sub>3</sub>(C<sub>6</sub>H<sub>5</sub>O<sub>7</sub>)<sub>2</sub>.7H<sub>2</sub>O at 18°, and 0.0058 gm. at 25°.

(Partheil and Hübner — Archiv. Pharm. 241, 413, '03.)

**BARIUM CYANIDE**

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**BARIUM CYANIDE**  $\text{Ba}(\text{CN})_2$ .SOLUBILITY IN WATER AND IN ALCOHOL AT  $14^\circ$ .

(Joannis — Ann. chim. phys. [5] 26, 480, '82.)

100 parts water dissolve 80 parts  $\text{Ba}(\text{CN})_2$ .100 parts 70% alcohol dissolve 18 parts  $\text{Ba}(\text{CN})_2$ .**BARIUM FERROCYANIDE AND BARIUM POTASSIUM FERROCYANIDE.**

(Wyruboff — Ann. chim. phys. [4] 16, 292, '69.)

100 parts water dissolve 0.1 part  $\text{Ba}_2\text{Fe}(\text{CN})_6 \cdot 6\text{H}_2\text{O}$  at  $15^\circ$ , and 1.0 part at  $75^\circ$ .100 parts water dissolve 0.33 part  $\text{BaK}_2\text{Fe}(\text{CN})_6 \cdot 5\text{H}_2\text{O}$  at ord. temp.**BARIUM FLUORIDE**  $\text{BaF}_2$ .

(Kohlrausch — Z. physik. Chem. 50, 365, '04-'05.)

1 liter of water dissolves 1.63 gms.  $\text{BaF}_2$  at  $18^\circ$ . Electrolytic conductivity method.**BARIUM FORMATE**  $\text{Ba}(\text{HCOO})_2 \cdot 2\text{H}_2\text{O}$ .

SOLUBILITY IN WATER.

(Krasnicki — Monatsb. Chem. 8, 597, '87.)

t°.	Gms. $\text{Ba}(\text{HCOO})_2$ per 100 Gms.		t°.	Gms. $\text{Ba}(\text{HCOO})_2$ per 100 Gms.	
	Water.	Solution.		Water.	Solution.
0	27.76	21.72	40	34.81	25.82
10	28.46	21.15	50	37.14	27.10
20	30.11	23.15	60	38.97	28.03
25	31.20	23.80	70	39.95	28.54
30	32.34	24.45	80	39.71	28.42

**BARIUM HYDROXIDE**  $\text{Ba}(\text{OH})_2$ .SOLUBILITY IN WATER. SOLID PHASE  $\text{Ba}(\text{OH})_2 \cdot 8\text{H}_2\text{O}$ .

(Rosenthal and Rühlmann — Jahresber. Chem. 314, '70.)

t°.	Gms. $\text{Ba}(\text{OH})_2$ per 100 Gms.		t°.	Gms. $\text{Ba}(\text{OH})_2$ per 100 Gms.	
	Water.	Solution.		Water.	Solution.
0	1.67	1.65	30	5.59	5.29
5	1.95	1.92	40	8.22	7.60
10	2.48	2.42	50	13.12	11.61
15	3.23	3.13	60	20.94	17.32
20	3.89	3.74	75	63.51	38.85
25	4.68	4.47	80	101.40	50.35

SOLUBILITY OF BARIUM HYDROXIDE IN AQUEOUS ACETONE AT  $25^\circ$ .

(Herz and Knoch — Z. anorg. Chem. 41, 321, '04.)

Sp. Gr. of Solutions.	Vol. % Acetone.	$\text{Ba}(\text{OH})_2$ per 100 cc. Sat. Solution.		Gms. $\text{Ba}(\text{OH})_2$ per 100 Gms. Solution.
		Millimols.	Grams.	
1.0479	0	55.08	4.722	4.506
1.0168	10	31.84	2.730	2.686
0.9927	20	17.79	1.525	1.536
0.9763	30	9.10	0.779	0.798
0.9561	40	4.75	0.407	0.426
0.9398	50	1.54	0.132	0.141
0.9179	60	0.48	0.041	0.045
0.8956	70	0.08	0.007	0.018

**BARIUM IODATE**  $\text{Ba}(\text{IO}_3)_2 \cdot \text{H}_2\text{O}$ .

## SOLUBILITY IN WATER.

(Trantz and Anschütz — Z. physik. Chem. 56, 238, '06.)

t°.	Gms. $\text{Ba}(\text{IO}_3)_2$ per 100 Gms. Solution.	t°.	Gms. $\text{Ba}(\text{IO}_3)_2$ per 100 Gms. Solution.	t°.	Gms. $\text{Ba}(\text{IO}_3)_2$ per 100 Gms. Solution.
- 0.046	0.008	30	0.031	70	0.093
+ 10	0.014	40	0.041	80	0.115
20	0.022	50	0.056	90	0.141
25	0.028	60	0.074	100	0.197

**BARIUM IODIDE**  $\text{BaI}_2$ .

## SOLUBILITY IN WATER.

(Kremers — Pogg. Ann. 103, 66, 1858; Etard — Ann. chim. phys. [7] 2, 544, '94.)

t°.	Gms. $\text{BaI}_2$ per 100 Gms. Water.	Solid Phase.	t°.	Gms. $\text{BaI}_2$ per 100 Gms. Water.	Solid Phase.
- 20	143.9	$\text{BaI}_2 \cdot 6 \text{H}_2\text{O}$	40	231.9	$\text{BaI}_2 \cdot 2 \text{H}_2\text{O}$
0	170.2	"	60	247.3	"
+ 10	185.7	"	80	261.0	"
20	203.1	"	100	271.7	"
25	212.5	"	120	281.7	"
30	219.6	"	160	294.8	"

Sp. Gr. of saturated solution at 19°.5 = 2.24.

For method of interpolating above results, see Note, page 33.

100 grams 97% Ethyl Alcohol dissolve 1.07 g.  $\text{BaI}_2 \cdot 2 \text{H}_2\text{O}$  at 15°.

(Rohland — Z. anorg. Chem. 15, 417, 1897.)

**BARIUM MALATE**  $\text{BaC}_4\text{H}_4\text{O}_6$ .

## SOLUBILITY IN WATER.

(Cantoni and Basadonna — Bull. soc. chim. [3] 35, 731, '06.)

t°.	Gms. $\text{BaC}_4\text{H}_4\text{O}_6$ per 100 cc. Sol.	t°.	Gms. $\text{BaC}_4\text{H}_4\text{O}_6$ per 100 cc. Sol.	t°.	Gms. $\text{BaC}_4\text{H}_4\text{O}_6$ per 100 cc. Sol.
20	0.883	35	0.895	60	1.011
25	0.901	40	0.891	70	1.041
30	0.903	50	0.942	80	1.044

## SOLUBILITY IN WATER AND IN ALCOHOL.

(Partheil and Hübner — Archiv. Pharm. 241, 413, '03.)

100 grams water dissolve 1.24 gms.  $\text{BaC}_4\text{H}_4\text{O}_6$  at 18°, and 1.3631 gms. at 25°.100 grams 95% alcohol dissolve 0.0038 gms.  $\text{BaC}_4\text{H}_4\text{O}_6$  at 18°, and 0.0039 gm. at 25°.**BARIUM MALONATE**  $\text{BaC}_2\text{H}_2\text{O}_4 \cdot \text{N}_2\text{O}$ .

## SOLUBILITY IN WATER.

(Miczynski — Monatsh. Chem. 7, 263, '86.)

t°.	Gms. $\text{BaC}_2\text{H}_2\text{O}_4$ per 100 Gms. Water.	Solid Phase.	t°.	Gms. $\text{BaC}_2\text{H}_2\text{O}_4$ per 100 Gms. Water.	Solid Phase.
0	0.143	0.143	50	0.287	0.285
10	0.179	0.179	60	0.304	0.303
20	0.212	0.211	70	0.317	0.316
30	0.241	0.240	80	0.326	0.325
40	0.266	0.265			

**BARIUM MOLYBDATE**  $\text{BaMoO}_4$ .100 parts water dissolve 0.0058 part  $\text{BaMoO}_4$  at 23°.

(Smith and Bradbury — Ber. 24, 2930, '91.)

# **BARIUM NITRATE**

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## **BARIUM NITRATE** $\text{Ba}(\text{NO}_3)_2$ .

### **SOLUBILITY IN WATER.**

(Mukder; Gay Lussac; Etard — Ann. chim. phys. [7] 2, 528, 94; Euler — Z. physik. Chem. 49, 315, '04.)

t°.	Gms. $\text{Ba}(\text{NO}_3)_2$ per 100 Gms.		t°.	Gms. $\text{Ba}(\text{NO}_3)_2$ per 100 Gms.	
	Water.	Solution.		Water.	Solution.
0	5.0	4.8	80	27.0	21.3
10	7.0	6.5	100	34.2	25.5
20	9.2	8.4	120	42.0	29.6
25	10.4	9.4	140	50.0	33.3
30	11.6	10.6	160	58.0	36.7
40	14.2	12.4	180	67.0	40.1
50	17.1	14.6	200	76.0	43.2
60	20.3	16.9	215	84.5	45.8

Sp. Gr. of saturated solution at 19.5° = 1.072.

### **SOLUBILITY OF MIXTURES OF BARIUM NITRATE AND LEAD NITRATE IN WATER AT 25°.**

(Fock. — Z. Kryst. Min. 28, 365, '97; at 17°, Euler — Z. physik. Chem. 49, 315, '04.)

Sp. Gr. of Solution.	In Solution.					In Solid Phase. Mol. % Ba(NO <sub>3</sub> ) <sub>2</sub>
	Gms. per Liter.		Mg. Mols. per Liter.		Mol. % Ba(NO <sub>3</sub> ) <sub>2</sub> .	
	Ba(NO <sub>3</sub> ) <sub>2</sub> .	Pb(NO <sub>3</sub> ) <sub>2</sub> .	Ba(NO <sub>3</sub> ) <sub>2</sub> .	Pb(NO <sub>3</sub> ) <sub>2</sub> .		
I. 079	102.2	0	391.0	0	100	100
I. 088	54.9	17.63	210.1	53.3	79.78	98.30
I. 108	86.5	49.80	330.7	150.7	68.70	96.74
I. 119	79.7	68.10	304.9	205.7	59.69	94.80
I. 140	77.0	97.20	294.4	293.6	50.09	93.62
I. 163	69.8	130.7	266.8	395.0	40.31	92.49
I. 198	66.0	177.3	252.5	535.6	32.03	90.07
I. 252	57.5	247.7	222.6	748.5	22.91	83.47
I. 294	25.9	334.3	99.2	1010.3	8.11	75.44
I. 376	28.8	429.7	110.3	1298.0	7.77	35.11
I. 459	...	553.8	0.0	1673.0	0.0	0.0

Tables of results are also given for 15°, 30°, and 47°.

### **SOLUBILITY OF MIXTURES OF BARIUM NITRATE AND POTASSIUM NITRATE IN WATER AT 25°.**

(Foote — Am. Ch. J. 32, 252, '04.)

Per 100 Grams Solution.		Solid Phase.
Gms. $\text{KNO}_3$ .	Grams $\text{Ba}(\text{NO}_3)_2$ .	
14.89	6.62	$\text{Ba}(\text{NO}_3)_2$ and 2 $\text{KNO}_3 \cdot \text{Ba}(\text{NO}_3)_2$ Double salt, 2 $\text{KNO}_3 \cdot \text{Ba}(\text{NO}_3)_2$ $\text{KNO}_3$ and 2 $\text{KNO}_3 \cdot \text{Ba}(\text{NO}_3)_2$
16.30	5.49	
21.99	3.04	
27.76	2.04	

# SOLUBILITY OF BARIUM NITRATE IN AQUEOUS PHENOL SOLUTIONS AT 25°.

(Rothmund and Wilsmore — Z. physik. Chem. 40, 620, '02.)

G. Mols. per Liter.		Gms. per Liter.		G. Mols. per Liter.		Gms. per Liter.	
C <sub>6</sub> H <sub>5</sub> OH	Ba(NO <sub>3</sub> ) <sub>2</sub>	C <sub>6</sub> H <sub>5</sub> OH	Ba(NO <sub>3</sub> ) <sub>2</sub>	C <sub>6</sub> H <sub>5</sub> OH	Ba(NO <sub>3</sub> ) <sub>2</sub>	C <sub>6</sub> H <sub>5</sub> OH	Ba(NO <sub>3</sub> ) <sub>2</sub>
0.000	0.3835	0.0	100.2	0.310	0.3492	29.12	91.31
0.045	0.3785	4.23	98.97	0.401	0.3400	37.73	88.90
0.082	0.3746	7.71	97.95	0.501	0.3299	47.11	86.26
0.146	0.3664	13.73	95.81	0.728 (sat.)	0.3098	68.45	81.00

# BARIUM NITRITE Ba(NO<sub>2</sub>)<sub>2</sub>·H<sub>2</sub>O.

## SOLUBILITY IN WATER.

(Vogel — Z. anorg. Chem. 35, 389, '03.)

t°.	0°	20°	25°	30°	35°
Gms. Ba(NO <sub>2</sub> ) <sub>2</sub> per 100 gms. H <sub>2</sub> O	58	63	71	82	97

# BARIUM OXALATE BaC<sub>2</sub>O<sub>4</sub>.

## SOLUBILITY OF THE THREE HYDRATES IN WATER.

(Groschuff — Ber. 34, 3318, '01.)

t°.	BaC <sub>2</sub> O <sub>4</sub> · $\frac{3}{2}$ H <sub>2</sub> O.		BaC <sub>2</sub> O <sub>4</sub> ·2H <sub>2</sub> O.		BaC <sub>2</sub> O <sub>4</sub> · $\frac{1}{2}$ H <sub>2</sub> O.	
	Gms. BaC <sub>2</sub> O <sub>4</sub> per 1000 g. Sol.	G. M. BaC <sub>2</sub> O <sub>4</sub> per 100 Mol. H <sub>2</sub> O.	Gms. BaC <sub>2</sub> O <sub>4</sub> per 1000 g. Sol.	G. M. BaC <sub>2</sub> O <sub>4</sub> per 100 G. M. H <sub>2</sub> O.	Gms. BaC <sub>2</sub> O <sub>4</sub> per 1000 g. Sol.	G. M. BaC <sub>2</sub> O <sub>4</sub> per 100 Mol. H <sub>2</sub> O.
0	0.058	0.00046	0.053	0.00042	0.089	0.00070
9.5	0.082	0.00066	...	...	...	...
18	0.112	0.00090	0.089	0.00071	0.124	0.00099
30	0.170	0.00136	0.121	0.00097	0.140	0.00112
40	...	...	0.152	0.00122	0.151	0.00121
45	...	...	0.169	0.00135	...	...
50	...	...	...	...	0.164	0.00131
55	...	...	0.212	0.00170	...	...
60	...	...	...	...	0.175	0.00140
65	...	...	0.250	0.00200	...	...
73	...	...	0.285	0.00228	...	...
75	...	...	...	...	0.188	0.00151
90	...	...	...	...	0.200	0.00160
100	...	...	...	...	0.211	0.00169

# SOLUBILITY OF BARIUM OXALATE (BaC<sub>2</sub>O<sub>4</sub>· $\frac{1}{2}$ H<sub>2</sub>O) IN AQUEOUS ACETIC ACID AT 26°-27°.

(Herz and Muhs. — Ber. 36, 3715, '03.)

Normality of Acetic Acid.	G. Residue* per 50.05 cc. Sol.	Gms. per 100 cc. Solution.		Normality of Acetic Acid.	G. Residue* per 50 cc. Sol.	Gms. per 100 cc. Solution	
		CH <sub>3</sub> COOH.	Ba Oxalate.			CH <sub>3</sub> COOH.	Ba Oxalate
0	0.0077	0.00	0.0154	3.85	0.0564	23.12	0.1127
0.565	0.0423	3.39	0.0845	5.79	0.0511	34.76	0.1021
1.425	0.0520	8.55	0.1039	17.30	0.0048	103.90	0.0096
2.85	0.0556	17.11	0.1111	...	...	...	...

\* Dried at 70°.



# BARIUM ACID OXALATE 52

## BARIUM ACID OXALATE $\text{BaC}_2\text{O}_4 \cdot \text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$ .

### SOLUBILITY IN WATER. (Groschuff.)

t°.	Gms. per 100 Gms. Solution.		Mols. per 100 Mols. $\text{H}_2\text{O}$ .		Mols. $\text{H}_2\text{C}_2\text{O}_4$ per 1 Mol. $\text{BaC}_2\text{O}_4$ .
	$\text{H}_2\text{C}_2\text{O}_4$ .	$\text{BaC}_2\text{O}_4$ .	$\text{H}_2\text{C}_2\text{O}_4$ .	$\text{BaC}_2\text{O}_4$ .	
0	0.27	0.030	0.054	0.0024	22
18	0.66	0.070	0.130	0.0056	24
20.5	0.76	0.076	0.15	0.0061	25
38	1.61	0.16	0.33	0.013	25
41	1.82	0.18	0.37	0.015	25
53	2.92	0.31	0.60	0.026	24
60	3.60	0.40	0.75	0.033	22.5
80	6.21	0.81	1.34	0.070	19
90	7.96	1.11	1.75	0.098	18
99	10.50	1.55	2.39	0.141	17

## BARIUM PROPIONATE $\text{Ba}(\text{C}_2\text{H}_3\text{O}_2)_2 \cdot \text{H}_2\text{O}$ . also $6\text{H}_2\text{O}$ .

### SOLUBILITY IN WATER.

(Krasnicki — Monatsh. Chem. 8, 597, '87.)

t°.	Gms. $\text{Ba}(\text{C}_2\text{H}_3\text{O}_2)_2$ per 100 Gms.		t°.	Gms. $\text{Ba}(\text{C}_2\text{H}_3\text{O}_2)_2$ per 100 Gms.	
	Water.	Solution.		Water.	Solution.
0	47.98	32.41	50	62.74	38.57
10	51.56	34.02	60	64.76	39.31
20	54.82	35.42	70	66.46	39.93
30	57.77	36.65	80	67.85	40.42
40	60.41	37.66	..	...	...

## BARIUM SULPHATE $\text{BaSO}_4$ .

### SOLUBILITY IN WATER.

#### Electrolytic Conductivity Method.

(Holleman; Kohlrausch and Rose — Z. physik. Chem. 12, 131, 241, '93.)

t°	2°	10°	19°	26°	34°	37.7°
Gm. $\text{BaSO}_4$ per liter	0.0017	0.0020	0.0023	0.0026	0.0029	0.0031

### SOLUBILITY OF BARIUM SULPHATE IN AQUEOUS SOLUTIONS OF HYDROCHLORIC AND OF NITRIC ACIDS.

(Banthisch — J. pr. Chem. 29, 54, 1884.)

In Hydrochloric Acid.				In Nitric Acid.			
cc. containing 1 Mg. Equiv. of HCl.	Mgs. $\text{BaSO}_4$ per 1 Mg. Equiv. of HCl.	Gms. per 100 cc. Solution.		cc. containing 1 Mg. Equiv. of $\text{HNO}_3$ .	Mgs. $\text{BaSO}_4$ per 1 Mg. Equiv. of $\text{HNO}_3$ .	Gms. per 100 cc. Solution.	
		HCl.	$\text{BaSO}_4$ .			$\text{HNO}_3$ .	$\text{BaSO}_4$ .
2.0	0.133	1.82	0.0067	2.0	0.140	3.15	0.0070
1.0	0.089	3.65	0.0089	1.0	0.107	6.31	0.0107
0.5	0.056	7.29	0.0101	0.5	0.085	12.61	0.0170
0.2	0.017	18.23	0.0086	0.2	0.048	31.52	0.0241

100 cc. HBr dissolve 0.04 gms.  $\text{BaSO}_4$ ; 100 cc. HI dissolve 0.0016 gms.  $\text{BaSO}_4$  at the boiling point.

(Haslam — Chem. News 53, 87, '86.)

**SOLUBILITY OF BARIUM SULPHATE IN AQUEOUS SOLUTIONS OF IRON, ALUMINUM AND MAGNESIUM CHLORIDES AT 20° — 25°.**

(Fraps. — Am. Ch. J. 27, 290, '01.)

Gms. Chloride per Liter.	Milligrams BaSO <sub>4</sub> per Liter in:			Gms. Chloride per Liter.	Mgs. BaSO <sub>4</sub> per Liter in:		
	Aq. FeCl <sub>3</sub> .	Aq. AlCl <sub>3</sub> .	Aq. MgCl <sub>2</sub> .		Aq. FeCl <sub>3</sub> .	Aq. AlCl <sub>3</sub> .	Aq. MgCl <sub>2</sub> .
1	58	33	30	25	150	116	50
2½	72	43	30	50	160	170	50
5	115	60	33	100	170	175	50
10	123	94	33	...	...	...	..

**BARIUM PERSULPHATE** BaS<sub>2</sub>O<sub>8</sub>·4H<sub>2</sub>O.

100 parts water dissolve 39.1 parts BaS<sub>2</sub>O<sub>8</sub> or 52.2 parts BaS<sub>2</sub>O<sub>8</sub>·4H<sub>2</sub>O at 0°.

(Marshall — J. Ch. Soc. 59, 771, '91.)

**BARIUM SULPHITE** BaSO<sub>3</sub>.

**SOLUBILITY IN WATER AND IN AQUEOUS SUGAR SOLUTIONS.**

(Rogowicz — Z. Ver Zuckerind. 938, 1905.)

Conc. of Sugar Sol.	Gm. BaSO <sub>4</sub> per 100 cc. Sol.		Conc. of Sugar Sol.	Gm. BaSO <sub>4</sub> per 100 cc. Sol.	
	at 20°.	at 80°.		at 20°.	at 80°.
0° Bx	0.0197	0.00177	40° Bx	0.0048	0.00158
10° "	0.0104	0.00335	50° "	0.0030	0.00149
20° "	0.0097	0.00289	60° " (sat.)	0.0022	0.00112
30° "	0.0078	0.00223	...	...	...

**BARIUM SUCCINATE AND BARIUM ISO SUCCINATE**



**SOLUBILITY OF EACH IN WATER.**

(Miczynski — Monatsh. Chem. 7, 263, 1886.)

t°.	Gms. Ba. Succinate per 100 Gms.		Gms. Ba. Iso Succinate per 100 Gms.	
	Water.	Solution.	Water.	Solution.
0	0.421	0.420	1.884	1.849
10	0.432	0.430	2.852	2.774
20	0.418	0.417	3.618	3.493
30	0.393	0.392	4.181	4.014
40	0.366	0.365	4.542	4.346
50	0.337	0.336	4.700	4.594
60	0.306	0.305	4.656	4.450
70	0.273	0.272	4.410	4.224
80	0.237	0.237	3.962	3.810

100 gms. H<sub>2</sub>O dissolve 0.396 gms. Ba Succinate at 18° and 0.410 gms. at 25°.

100 gms. 95% alcohol dissolve 0.0015 gms. Ba Succinate at 18° and 0.0016 gms. at 25°.

(Partheil and Hübner — Archiv. Pharm. 241, 413, '03.)

**BARIUM TARTRATE** Ba(C<sub>2</sub>H<sub>3</sub>O<sub>2</sub>)<sub>2</sub>.

**SOLUBILITY IN WATER.**

(Cantoni and Zachoder — Bull. soc. chim. [3] 33, 751, '05; see also Partheil and Hübner.)

t°.	Gms. Ba(C <sub>2</sub> H <sub>3</sub> O <sub>2</sub> ) <sub>2</sub> per 100 cc. Solution.		t°.	Gms. Ba(C <sub>2</sub> H <sub>3</sub> O <sub>2</sub> ) <sub>2</sub> per 100 cc. Solution.		t°.	Gms. Ba(C <sub>2</sub> H <sub>3</sub> O <sub>2</sub> ) <sub>2</sub> per 100 cc. Solution.	
0	0.0205		30	0.0315		70	0.0480	
10	0.0242		40	0.0352		80	0.0527	
20	0.0279		50	0.0389		90	0.0541	
25	0.0297		60	0.0440		..	...	

# **BARIUM TARTRATE**

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## **SOLUBILITY OF BARIUM TARTRATE IN AQUEOUS ACETIC ACID** SOLUTIONS at 26°-27°.

(Herz and Muhs — Ber. 36, 3715, '03.)

Normality of Acetic Acid.	Gms. residue* per 50 cc. Sol.	Gms. per 100 cc. Solution.		Normality. of Acetic Acid.	Gms. residue* per 50 cc. Sol.	Gms. per 100 cc. Solution	
		CH <sub>3</sub> COOH.	Ba tartrate.			CH <sub>3</sub> COOH.	Ba tartrate.
0	0.0328	0.0	0.0655	3.77	0.1866	22.62	0.3728
0.565	0.1151	3.39	0.2300	5.65	0.1865	33.90	0.3726
1.425	0.1559	8.55	0.3115	16.85	0.0218	101.10	0.0436
2.85	0.1739	17.11	0.3475	...	...	...	...

\* Dried at 70°.

100 grams 95% alcohol dissolve 0.032 gm. Ba tartrate at 18° and 0.0356 gm. at 25°.

(Partheil and Hübner.)

# **BENZALDEHYDE** C<sub>6</sub>H<sub>5</sub>COH.

100 gms. H<sub>2</sub>O dissolve 0.3 gm. benzaldehyde at room temperature.

(Flückiger — Arch. Pharm. [3] 7, 103, '75.)

# **BENZAMIDE** C<sub>6</sub>H<sub>5</sub>CONH<sub>2</sub>.

## **SOLUBILITY IN ETHYL ALCOHOL.**

(Speyers — Am. J. Sci. [4] 14, 295, '02.)

°.	Sp. Gr. of Solutions.	G. M. C <sub>6</sub> H <sub>5</sub> CONH <sub>2</sub> per 100 G.M. C <sub>2</sub> H <sub>5</sub> OH.	Gms. C <sub>6</sub> H <sub>5</sub> CONH <sub>2</sub> per 100 Gms. C <sub>2</sub> H <sub>5</sub> OH.	°.	Sp. Gr. of Solutions.	G. M. C <sub>6</sub> H <sub>5</sub> CONH <sub>2</sub> per 100 G.M. C <sub>2</sub> H <sub>5</sub> OH.	Gms. C <sub>6</sub> H <sub>5</sub> CONH <sub>2</sub> per 100 Gms. C <sub>2</sub> H <sub>5</sub> OH.
0	0.833	3.1	8.15	40	0.848	11.0	28.92
10	0.832	4.2	11.04	50	0.862	14.2	37.34
20	0.833	5.9	15.52	60	0.881	17.2	45.22
25	0.835	6.8	17.87	70	0.913	20.4	53.63
30	0.838	8.2	21.56	..	...	...	...

## **SOLUBILITY OF BENZAMIDE IN MIXTURES OF ALCOHOL AND WATER** AT 25°.

(Holleman and Antusch — Rec. trav. chim. 13, 294, '94.)

Vol. % Alcohol.	Gms. C <sub>6</sub> H <sub>5</sub> CONH <sub>2</sub> per 100 Gms. Solvent.	Sp. Gr. of Solutions.	Vol. % Alcohol.	Gms. C <sub>6</sub> H <sub>5</sub> CONH <sub>2</sub> per 100 Gms. Solvent.	Sp. Gr. of Solutions.
100	17.03	0.830	70	23.87	0.925
95	21.12	0.856	60	18.98	0.939
90	24.50	0.878	50	13.74	0.949
85	26.15	0.895	40	8.62	0.958
83	26.63	0.900	31	5.33	0.967
80	26.43	0.907	15	2.28	0.912
75	25.41	0.917	0	1.35	0.999

# **BENZENE** C<sub>6</sub>H<sub>6</sub>.

## **SOLUBILITY IN WATER AT 22°.**

(Herz — Ber. 31, 2671, '08.)

100 cc. water dissolve 0.082 cc. C<sub>6</sub>H<sub>6</sub>, Vol. of Sol. = 100.082,  
Sp. Gr. = 0.9979.  
100 cc. C<sub>6</sub>H<sub>6</sub> dissolve 0.211 cc. H<sub>2</sub>O, Vol. of sol. = 100.135,  
Sp. Gr. = 0.8768.

## BENZENE, ACETIC ACID, WATER MIXTURES.

(Lincoln — J. Physic. Chem. 8, 241, '04.)

NOTE. — To mixtures of known amounts of acetic acid and benzene, water was gradually added until clouding occurred. The same degree of clouding did not represent the end point in all cases, as was assumed by Waddel. (J. Physic. Chem. 4, 161, '00.)

At 25°.			At 35°.		
cc. CH <sub>3</sub> COOH.	cc. C <sub>6</sub> H <sub>6</sub> .	cc. H <sub>2</sub> O.	cc. CH <sub>3</sub> COOH.	cc. C <sub>6</sub> H <sub>6</sub> .	cc. H <sub>2</sub> O.
5	10.06	0.45	100	18.10	1.14
5	8.04	0.55	100	16.09	1.22
5	6.03	0.64	100	10.06	1.55
5	3.02	0.98	100	6.03	2.17
5	2.01	1.28	100	4.02	2.77
5	1.01	1.89	100	3.01	3.26
5	0.60	2.80	100	1.00	7.01
5	0.35	4.54	100	0.65	10.10
5	0.17	9.53	100	0.47	13.64

## BENZENE, Aq. ALCOHOL MIXTURES; BENZENE, Aq. ACETONE MIXTURES AT 20°.

H<sub>2</sub>O added to mixtures of known amounts of the other two and appearance of clouding noted.

(Bancroft — Phys. Rev. 3, 31, 1895.96.)

C<sub>6</sub>H<sub>6</sub>, C<sub>2</sub>H<sub>5</sub>OH and H<sub>2</sub>O    C<sub>6</sub>H<sub>6</sub>, CH<sub>3</sub>OH and H<sub>2</sub>O    C<sub>6</sub>H<sub>6</sub>, (CH<sub>3</sub>)<sub>2</sub>CO and H<sub>2</sub>O

Per 5 cc. C <sub>2</sub> H <sub>5</sub> OH.		Per 5 cc. CH <sub>3</sub> OH.		Per 5 cc. (CH <sub>3</sub> ) <sub>2</sub> CO.	
cc. H <sub>2</sub> O.	cc. C <sub>6</sub> H <sub>6</sub> .	cc. H <sub>2</sub> O.	cc. C <sub>6</sub> H <sub>6</sub> .	cc. H <sub>2</sub> O.	cc. C <sub>6</sub> H <sub>6</sub> .
20	0.03	5.0	0.15	8.0	0.10
8	0.13	3.0	0.215	3.0	0.395
4	0.39	2.0	0.59	2.0	0.69
2	1.17	1.4	1.0	1.3	1.0
1.5	1.87	1.0	1.9	0.51	2.0
1.0	3.57	0.8	3.0	0.295	3.0
0.605	8.0	0.69	4.0	0.2	4.0
0.34	20.0	0.49	8.0	0.15	5.0

MUTUAL SOLUBILITY OF BENZENE AND  $\beta$  NAPHTHALENE PICRATE  
C<sub>6</sub>H<sub>5</sub>(NO<sub>2</sub>)<sub>2</sub>OH.C<sub>10</sub>H<sub>7</sub>OH.

"Synthetic Method" used — see Note, p. 9.

(Kuriloff — Z. physik. Chem. 24, 442, '97.)

t°.	Gms. Picrate.	Gms. Benzene	$\alpha$	t°.	Gms. Picrate.	Gms. Benzene.	$\alpha$
157	100.0	...	100.0	111.6	1.173	1.037	19.2
148.4	2.128	0.115	79.3	102.0	1.087	1.780	11.2
137.4	1.274	0.170	61.1	29.5	0.390	8.430	0.95
134.2	1.384	0.297	49.3	4.6	1.329	21.80	0.48
126.8	1.019	0.343	38.3	5.02	...	100.0	...

$\alpha$  = Mols.  $\beta$  Naphthalene Picrate per 100 Mols. of  $\beta$  Naphthalene Picrate plus Benzene.

Determinations for a large number of isothermes are also given.

# BENZENE

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## SOLUBILITY OF BENZENE IN SULPHUR.

By "Synthetic Method," see Note, p. 9.  
(Alexejew — Ann. Physik. Chem. 28, 305, '86.)

t°.	Gms. C <sub>6</sub> H <sub>6</sub> per 100 Gms.		t°.	Gms. C <sub>6</sub> H <sub>6</sub> per 100 Gms.	
	S Layer.	C <sub>6</sub> H <sub>6</sub> Layer.		S Layer.	C <sub>6</sub> H <sub>6</sub> Layer.
100	6	75	140	16	61
110	8	72.5	150	19	55
120	10	70	160	25	45
130	12	66	164 (crit. temp.)	35	

Di Brom **BENZENE** (p) C<sub>6</sub>H<sub>4</sub>Br<sub>2</sub>.

SOLUBILITY IN ETHYL, PROPYL, ISO BUTYL ALCOHOLS, ETC.  
(Schröder — Z. physik. Chem. 11, 456, '93.)

Determinations by "Synthetic Method" see Note, p. 9.

t°.	Grams C <sub>6</sub> H <sub>4</sub> Br <sub>2</sub> (p) per 100 Grams Sat. Solution in:						
	C <sub>2</sub> H <sub>5</sub> OH.	C <sub>3</sub> H <sub>7</sub> OH.	(CH <sub>3</sub> )CH.CH <sub>2</sub> OH.	(C <sub>2</sub> H <sub>5</sub> ) <sub>2</sub> O.	CS <sub>2</sub> .	C <sub>6</sub> H <sub>6</sub> .	C <sub>6</sub> H <sub>5</sub> Br.
0	...	..	...	..	27	..	..
10	...	..	...	30	34	34	22
20	...	..	...	38	43	43	29
30	14	..	15	47	53	53	36
40	19	..	20	57	62	62	45
50	26	27	30	67	72	71	54
60	38	40	44	77	81	80	67
70	57.6	67	65	87	90	88	79
75	80.5	85	77	..	..	..	84
80	94.4	95	94.6	..	..	..	90

Chlor **BENZENE** C<sub>6</sub>H<sub>5</sub>Cl.

## SOLUBILITY OF CHLOR BENZENE IN SULPHUR.

"Synthetic Method," see page 9.  
(Alexejew.)

t°.	Grams C <sub>6</sub> H <sub>5</sub> Cl per 100 Grams.	
	Sulphur Layer.	Chlor Benzene Layer.
90	13	70
100	18.5	63
110	27	53
116 (crit. temp.)	38	

For the solubility of Mixtures of di Chlor Benzene and di Brom Benzene in aqueous Ethyl Alcohol solutions see Thiel.  
(Z. physik. Chem. 43, 656, 1903.)

Di Nitro **BENZENE** (m) C<sub>6</sub>H<sub>4</sub>(NO<sub>2</sub>)<sub>2</sub>.

SOLUBILITY IN BENZENE, BROM BENZENE AND IN CHLOROFORM.

"Synthetic Method."

(Schröder.)

t°.	Gms. C <sub>6</sub> H <sub>4</sub> (NO <sub>2</sub> ) <sub>2</sub> per 100 Gms. Sol. in:			t°.	Gms. C <sub>6</sub> H <sub>4</sub> (NO <sub>2</sub> ) <sub>2</sub> per 100 Gms. Sol. in:		
	C <sub>6</sub> H <sub>6</sub> .	C <sub>6</sub> H <sub>5</sub> Br.	CHCl <sub>3</sub> .		C <sub>6</sub> H <sub>6</sub> .	C <sub>6</sub> H <sub>5</sub> Br.	CHCl <sub>3</sub> .
15	17.5	...	22.2	40	52.0	38.0	42.0
20	26.0	18.5	25.0	50	62.5	47.5	52.5
25	33.0	23.7	29.0	60	71.0	57.0	65.0
30	40.0	28.7	33.0	..	...	...	...

Solubilities of Di-Nitro **BENZENES** and of Tri-Nitro **BENZENES** in Several Solvents.

(de Bruyn — Rec. trav. chim. 13, 116, 150, '94.)

Solvent.	t°.	Grams per 100 Grams Solvent.				
		(o)C <sub>6</sub> H <sub>4</sub> (NO <sub>2</sub> ) <sub>2</sub> .	(m)C <sub>6</sub> H <sub>4</sub> (NO <sub>2</sub> ) <sub>2</sub> .	(p)C <sub>6</sub> H <sub>4</sub> (NO <sub>2</sub> ) <sub>2</sub> .	(s)C <sub>6</sub> H <sub>3</sub> (NO <sub>2</sub> ) <sub>3</sub> .	(st)C <sub>6</sub> H <sub>2</sub> (NO <sub>2</sub> ) <sub>3</sub> .
Methyl Alcohol	20.5	3.30	6.75	0.69	4.9 (16°)	16.2 (15.5°)
Ethyl Alcohol	20.5	1.9	3.5	0.4	1.9 (16°)	5.45 (15.5°)
Propyl Alcohol	20.5	1.09	2.4	0.298	...	...
Carbon Bi-Sulphide	17.6	0.236	1.35	0.148	0.25	...
Chloroform	17.6	27.1	32.4	1.82	6.1	...
Benzene	18.2	5.66	39.45	2.56	6.2 (16°)	...
Ether	17.5	...	...	...	1.5	...
Ethyl Acetate	18.2	12.96	36.27	3.56	...	...
Toluene	16.2	3.62	30.66	2.36	...	...
Carbon Tetra Chloride	16.2	0.143	1.18	0.12	...	...
Water	(ord.)	0.014	0.0525	0.008	...	...

Symmetrical Tri-Nitro **BENZENE**.

## SOLUBILITY IN AQUEOUS ALCOHOL AT 25°.

(Holleman and Antusch — Rec. trav. chim. 13, 296, '94.)

Vol. % Alcohol.	G. C <sub>6</sub> H <sub>3</sub> (NO <sub>2</sub> ) <sub>3</sub> (s) per 100 g. Solvent.	Sp. Gr. of Solutions.	Vol. % Alcohol.	G. C <sub>6</sub> H <sub>3</sub> (NO <sub>2</sub> ) <sub>3</sub> (s) per 100 g. Solvent.	Sp. Gr. of Solutions.
100	2.34	0.7957	80	0.57	0.8582
95	1.57	0.8131	75	0.47	0.8708
90	1.12	0.8288	70	0.37	0.8808
85	0.79	0.8436	60	0.23	0.9064

**BENZOYL PHENYL HYDRAZINE** C<sub>6</sub>H<sub>5</sub>.NH.NH.C<sub>6</sub>H<sub>5</sub>O.

## SOLUBILITY IN AQUEOUS ALCOHOL.

(Holleman and Antusch — Rec. trav. chim. 13, 291, '94.)

Vol. % Alcohol.	Gms. Hydrazine per 100 g. Solvent.	Sp. Gr. Solutions.	Vol. % Alcohol.	Gms. Hydrazine per 100 g. Solvent.	Sp. Gr. Solutions.
100	2.39	0.793	80	1.59	0.859
95	2.43	0.814	70	1.08	0.884
93	3.00	0.822	55	0.51	0.917
90	2.26	0.831	40	0.16	0.946

**BENZO SULPHONIC ACIDS.**

## SOLUBILITY IN WATER.

(Bahlman — Liebig's Ann. 186, 309, '77.)

Name of Acid.	Gms. Sulphonic Acid per 100 Gms. Solution at:	
	11° = 1.301	15° = 1.436
<i>o</i> -Amido benzo sulphonic acid.	8° = 0.737	16° = 1.131*
Amido brom benzo sulphonic acid.	12° = 0.431	15° = 0.463
Mono brom amido benzo sulphonic acid.	14° = 1.713	9° = 1.098
Barium di-brom benzo sulphonic acid.		
Barium nitro brom benzo sulphonic acid (hydrated).	16° = 0.527	30° = 0.914
Barium nitro brom benzo sulphonic acid (anhydrous).	8° = 0.156	

\* At 18° = 1.201.

# BENZINE

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## BENZINE (Petroleum) $C_6H_{12}, C_6H_{14}$ .

100 parts of alcohol dissolve about 16 parts benzine of 0.638 — 0.660 Sp. Gr., at 25°.

## BENZOIC ACID $C_6H_5COOH$ .

### SOLUBILITY IN WATER.

(Bourgoin — Ann. chim. phys. [5] 15, 171, '78.)

t°.	Grams. $C_6H_5COOH$ per 100 Gms.		t°.	Grams. $C_6H_5COOH$ per 100 Gms.	
	Water.	Solution.		Water.	Solution.
0	0.170	0.170	40	0.555	0.551
10	0.210	0.209	50	0.775	0.768
20	0.290	0.289	60	1.155	1.142
25	0.345	0.343	80	2.715	2.643
30	0.410	0.408	100	5.875	5.549

100 grams saturated aqueous solution contains 0.340 gram  $C_6H_5COOH$  at 25°; 0.353 gram at 26.4°; 0.667 gram at 45°.

(Paul — Z. physik. Ch. 24, 111, '94; Noyes and Chapin — *Ibid.* 27, 443, '98; Hoffman and Langbeck — *Ibid.* 51, 393, '05; Philip — J. Ch. Soc. 87, 999, '05; see also Alexejew — Ann. Phys. Ch. 28, 305, '86; Ost — J. pr. Ch. [2] 17, 232, '78; Vaubel — *Ibid.* [2] 52, 73, '95.)

### SOLUBILITY OF MIXTURES OF LIQUID BENZOIC ACID AND WATER.

(Alexejew.)

Determinations by "Synthetic Method," see Note, p. 9. Figures read from curve.

t°.	Gms. $C_6H_5COOH$ per 100 Gms.			t°.	Gms. $C_6H_5COOH$ per 100 Gms.		
	Aq. Layer.	Benzoic Ac.	Layer.		Aq. Layer.	Benzoic Ac.	Layer.
70	6		83	100	12.0		69.0
80	7.5		79.5	110	18.0		59.0
90	8.5		76	116 (crit. temp.)	35		

### SOLUBILITY OF BENZOIC ACID IN AQUEOUS SOLUTIONS OF:

(Hoffman and Langbeck.)

#### Potassium Chloride at 25°.

Normality of Aq. KCl.	Gms. KCl. per Liter.	Dissolved $C_6H_5COOH$ .	
		Mol. Conc.	Wt. per cent.
0.02	1.49	$5.0254 \cdot 10^{-4}$	0.339
0.05	3.73	4.9801	" 0.333
0.20	14.92	4.7639	" 0.322
0.50	37.30	4.3632	" 0.295

#### Potassium Nitrate at 25°.

Normality of Aq. $KNO_3$ .	Gms. $KNO_3$ per Liter.	Dissolved $C_6H_5COOH$ .	
		Mol. Conc.	Wt. per cent.
0.02	2.02	$5.0326 \cdot 10^{-4}$	0.340
0.05	5.06	5.0421	" 0.341
0.20	20.24	5.0297	" 0.340
0.50	50.59	4.9400	" 0.334
1.00	101.19	4.7646	" 0.322

### SOLUBILITY OF BENZOIC ACID IN AQUEOUS SOLUTIONS OF:

(Hoffmann and Langbeck.)

#### Sodium Chloride.

Normality of Aq. NaCl.	Gms. NaCl per Liter.	Gms. $C_6H_5COOH$ per 100 Gms. Sol.	
		at 25°.	at 45°.
0.00	0.00	0.340	0.667
0.02	1.17	0.339	0.663
0.05	2.93	0.335	0.654
0.20	11.70	0.336	0.617
0.50	29.25	0.282	0.546
1.00	58.50	...	0.449

#### Sodium Nitrate.

Normality of Aq. $NaNO_3$ .	Gms. $NaNO_3$ per Liter.	Gms. $C_6H_5COOH$ per 100 Gms. Sol.	
		at 25°.	at 45°.
0.02	1.70	0.340	0.666
0.05	8.51	0.339	0.663
0.20	17.02	0.333	0.647
0.50	42.54	0.319	0.613
1.00	85.09	0.294	...

# SOLUBILITY OF BENZOIC ACID IN AQUEOUS SOLUTIONS OF SODIUM ACETATE, FORMATE, BUTYRATE, AND SALICYLATE.

(Noyes and Chapin — Z. physik. Chem. 27, 443, '98; Philip — J. Ch. Soc. 87, 992, '05.)

Grams Sodium Salt per Liter.	Grams $C_6H_5COOH$ per Liter of Solution in:					
	$CH_3COONa$ .		$HCOONa$ .		$C_3H_7COONa$ , $C_6H_5OH.COONa$ .	
	At 25°.	At 26.4°.	At 25°.	At 26.4°.	At 26.4°.	At 26.4°.
0	3.41	3.53	3.41	3.53	3.53	3.53
1	4.65	4.75	4.25	4.35	4.50	3.62
2	5.70	5.85	4.75	4.85	5.40	3.70
3	6.70	6.90	5.20	5.30	6.15	3.80
4	7.60	7.85	5.60	5.70	6.90	3.87
6	...	...	...	...	8.40	4.00
8	...	...	...	...	...	4.10

Gram. Mols. Sodium Salt per Liter.	Gram Molecules $C_6H_5COOH$ per Liter of Solution in:					
	$CH_3COONa$ .		$HCOONa$ .		$C_3H_7COONa$ , $C_6H_5OH.COONa$ .	
	At 25°.	At 26.4°.	At 25°.	At 26.4°.	At 26.4°.	At 26.4°.
0.00	0.0279	0.0289	0.0279	0.0289	0.0289	0.0289
0.01	0.0362	0.0370	0.0330	0.0336	0.0376	0.0300
0.02	0.0440	0.0448	0.0364	0.0372	0.0455	0.0312
0.03	0.0508	0.0518	0.0392	0.0398	0.0525	0.0321
0.04	0.0572	0.0586	0.0416	0.0423	0.0596	0.0328
0.06	...	...	0.0460	0.0466	...	0.0342

## SOLUBILITY OF BENZOIC ACID IN ABSOLUTE ALCOHOLS.

(Timofeev — Compt. rend. 112, 1137, '91; at 15°, Bourgoin — Ann. chim. phys., [5] 13, 406, '78.)

	In Methyl Alcohol.		In Ethyl Alcohol.		In Propyl Alcohol.	
t°.	G. $C_6H_5COOH$ per 100 Gms.		G. $C_6H_5COOH$ per 100 Gms.		G. $C_6H_5COOH$ per 100 Gms.	
	$CH_3OH$ .	Solution.	$C_2H_5OH$ .	Solution.	$C_3H_7OH$ .	Solution.
3	50.16	33.39	40.16	28.65	29.88	23.00
15	...	...	46.70	31.80	...	...
21	69.29	40.93	54.09	35.10	40.64	28.90

## SOLUBILITY OF BENZOIC ACID IN 90% ALCOHOL, IN ETHER AND IN CHLOROFORM.

(Bourgoin.)

Solvent.	t°.	Gms. $C_6H_5COOH$ per 100 Grams.	
		Solvent.	Solution.
90% Alcohol	15	41.62	29.39
Ether	15	31.35	23.86
Chloroform	25	14.30	12.50

## SOLUBILITY OF BENZOIC ACID IN AQUEOUS SOLUTIONS OF DEXTROSE.

(Hoffman and Langbeck.)

Normality of Aq. Dextrose.	Gms. $C_6H_5O_6$ per Liter.	Dissolved $C_6H_5COOH$ at 25°.		Dissolved $C_6H_5COOH$ at 4°.	
		Mol. Conc.	Weight Per Cent.	Mol. Conc.	Weight Per Cent.
0.02	3.67	$5.0322 \cdot 10^{-4}$	0.34	$9.9088 \cdot 10^{-4}$	0.674
0.05	9.00	5.0403 "	0.34	9.9328 "	0.669
0.204	36.73	5.0303 "	0.34	9.9323 "	0.669
0.533	96.15	5.0321 "	0.34	10.0101 "	0.674
1.068	192.30	5.0443 "	0.341	10.0369 "	0.676



# BENZOIC ACID

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## SOLUBILITY OF BENZOIC ACID IN AQUEOUS SOLUTIONS OF UREA AND OF THIO UREA.

(Hoffman and Langbeck.)

	Normality of Solution.	Gms. per Liter.	C <sub>6</sub> H <sub>5</sub> COOH Dissolved at 25°.	
			Mol. Conc.	Wt. per cent.
In Aqueous Urea	0.10	6.01	CO(NH <sub>2</sub> ) <sub>2</sub>	5.1876 · 10 <sup>-4</sup> 0.350
In Aqueous Thio Urea	0.20	15.23	CS(NH <sub>2</sub> ) <sub>2</sub>	5.4994 " 0.372

## Amido BENZOIC ACIDS C<sub>6</sub>H<sub>4</sub>.NH<sub>2</sub>.COOH (m).

### SOLUBILITY IN WATER AND IN OTHER SOLVENTS.

(de Coninck — Compt. rend. 116, 758, '93.)

In Water.		In Organic Solvents.		
t°.	Gms. C <sub>6</sub> H <sub>4</sub> .NH <sub>2</sub> .COOH(m) per 100 cc. H <sub>2</sub> O.	Solvent.	t°.	Gms. C <sub>6</sub> H <sub>4</sub> .NH <sub>2</sub> .COOH(m) per 100 cc. Solvent.
0	0.43	Ethyl Alcohol (95%)	12.5	2.92
10	0.52	Methyl Alcohol (pure)	10.5	4.05
20	0.67	Acetone	11.3	6.22
30	0.87	Methyl Iodide	10.0	0.04
40	1.15	Ethyl Iodide	0.0	0.02
50	1.50	Chloroform	12.0	0.07
60	2.15	Bromoform	8.0	trace
70	3.15			

## SOLUBILITY OF THE THREE ISOMERIC AMIDO NITRO BENZOIC ACIDS.

In Ether.				In Ethyl Alcohol (90%).			
t°.	Gms. C <sub>6</sub> H <sub>3</sub> NO <sub>2</sub> .NH <sub>2</sub> .COOH per 100 cc. Ether.			t°.	Gms. C <sub>6</sub> H <sub>3</sub> NO <sub>2</sub> .NH <sub>2</sub> .COOH per 100 cc. Alcohol.		
	Ortho.	Meta.	Para.		Ortho.	Meta.	Para.
2.7	10.84	1.70	6.41	3	8.13	1.79	8.4
5.8	16.05 (6.8°)	1.81	8.21	9.6	10.70	2.20	11.3

## SOLUBILITY IN WATER OF THE THREE ISOMERIC:

(Vaubel — J. pr. Chem. [2] 52, 72, '95.)

### Amido Benzo Sulphonic Acids.

t°.	G. C <sub>6</sub> H <sub>4</sub> .NH <sub>2</sub> .SO <sub>3</sub> H per 100 g. Aq. Sol.		
	Ortho.	Meta.	Para.
7	1.06	1.276	0.592 (6°)

### Amido Phenols.

t°.	G. C <sub>6</sub> H <sub>4</sub> (OH).NH <sub>2</sub> per 100 g. Aq. Sol.		
	Ortho.	Meta.	Para.
0	1.7	2.6 (20°)	1.1

## Brom, Chlor, and Iodo BENZOIC ACIDS.

### SOLUBILITY IN WATER AT 25°.

(Paul — Z. physik. Chem. 14, 111, '04; Löwenherz — *Ibid.* 25, 401, '98; Vaubel.)

Compound.	Formula.	Per 1000 cc. Aqueous Solution.	
		Grams.	Gram Mol.
Brom benzoic acid.	C <sub>6</sub> H <sub>4</sub> Br.COOH (ortho).	1.856	0.00924
Brom benzoic acid.	C <sub>6</sub> H <sub>4</sub> Br.COOH (meta).	0.402	0.00200
Brom benzoic acid.	C <sub>6</sub> H <sub>4</sub> Br.COOH (para).	0.056	0.00028
Chlor benzoic acid.	C <sub>6</sub> H <sub>4</sub> Cl.COOH (ortho).	2.087	0.01333
Iodo benzoic acid.	C <sub>6</sub> H <sub>4</sub> I.COOH (ortho).	0.95	...
Iodo benzoic acid.	C <sub>6</sub> H <sub>4</sub> I.COOH (meta).	0.12	...

**SOLUBILITY OF ORTHO HYDROXY BENZOIC ACID (SALICYLIC ACID), META HYDROXY BENZOIC ACID, AND PARA HYDROXY BENZOIC ACID (ANISIC ACID) IN WATER, BENZENE, ETC. (See also pp. 38 and 274.)**

(Walker and Wood — J. Ch. Soc. 73, 622, '98; Vaubel — J. pr. Chem. [2] 52, 73, '95.)

100 gms. aq. solution contain 0.225 gm.  $C_6H_4.OH.CO_2H$  (*o*) at 15° (Vaubel).

100 gms. aq. solution contains 0.794 gm.  $C_6H_4.OH.CO_2H$  (*p*) at 15° (Vaubel).

t°.	Gms. $C_6H_4.OH.CO_2H$ per 100 Gms. $H_2O$ .		Gms. $C_6H_4.OH.CO_2H$ per 100 Gms. $C_6H_6$ .	
	Meta.	Para.	Meta.	Para.
10	0.55	0.25	...	0.0018
20	0.90	0.50	0.008	0.0027
25	1.08	0.65	0.010	0.0035
30	1.34	0.81	0.012	0.0045
35	1.64	1.01	0.015	0.0060
40	2.10	1.24	0.017	0.0082
50	3.10	2.12	0.028	0.0162
60	...	...	0.047	0.028
80	...	...	...	0.066

**In Acetone.**

t°.	G. $C_6H_4.OH.CO_2H$ per 100 cc. Sol.	
	Meta.	Para.
23	26.0	22.7

**In Ether.**

t°.	G. $C_6H_4.OH.CO_2H$ per 100 cc. Sol.	
	Meta.	Para.
17	9.73	9.43

**Methyl BENZOIC ACIDS  $C_6H_4.CO_2H.CH_3$ . *o*, *m*, and *p*.**

**SOLUBILITY IN WATER.**

(Vaubel.)

t°.	Gms. $C_6H_4.CO_2H.CH_3$ per 1000 Gms. Sat. Solution.		
	Ortho.	Meta.	Para.
25°	1.18	0.98	0.35

**Nitro BENZOIC ACIDS  $C_6H_4.NO_2.CO_2H$ . *o*, *m*, and *p*.**

**SOLUBILITY IN SEVERAL SOLVENTS.**

(de Coninck — Compt. rend. 118, 471, '94; for solubility in  $H_2O$ , see also Paul, Vaubel, Löwenherz, and Goldschmidt — Z. physik. Chem. 25, 95, '96.)

Solvent.	t°.	Gms. $C_6H_4.NO_2.CO_2H$ per 100 cc. Solvent.		
		Ortho.	Meta.	Para.
Water	20	0.682 (0.654G.)	0.315	0.039
Water	25	0.743-0.779	0.341	0.028
Water	30	0.922	...	...
Methyl Alcohol	10	42.72	47.34	9.6
Ethyl Alcohol	10	28.2	33.1 (11.7°)	0.9
Ethyl " (33 Vol.%)	15	0.64 (11.8°)	0.52	0.055
Acetone	10	41.5	41.5	4.54
Benzene	10	0.294	0.795	0.017 (12.5°)
Carbon Bi-Sulphide	10	0.012	0.10 (8.5°)	0.007
Chloroform	10	0.455 (11.°)	5.678	0.066
Ether	10	21.58	25.175	2.26
Ligroin	10	trace	0.013	0.00

# BENZOIC ACIDS

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## SOLUBILITY OF PARA NITRO BENZOIC ACID IN AQUEOUS SOLUTIONS OF ANILIN AND OF PARA TOLUIDIN AT 25°.

(Löwenherz — Z. physik. Chem. 25, 395, '98.)

In Anilin.				In <i>p</i> -Toluidin.			
G. Mols. per Liter.		Gms. per Liter.		G. Mols. per Liter.		Gms. per Liter.	
$C_6H_5NH_2$	$C_6H_4NO_2COOH$	$C_6H_5NH_2$	$C_6H_4NO_2COOH$	$C_6H_4NH_2CH_3$	$C_6H_4NO_2COOH$	$C_6H_4NH_2CH_3$	$C_6H_4NO_2COOH$
0.0	0.00164	0.0	0.274	0.0	0.00164	0.0	0.274
0.01	0.00841	0.91	1.406	0.01	0.0100	1.071	1.671
0.02	0.01379	1.82	2.304	0.02	0.0174	2.142	2.902
0.04	0.02172	3.64	3.629	0.03	0.0245	3.213	4.097
0.08	0.0347	7.29	5.798				

## SOLUBILITY OF ORTHO NITRO BENZOIC ACID IN AQUEOUS SOLUTIONS OF SODIUM BUTYRATE, ACETATE, FORMATE, AND SALICYLATE AT 26.4°.

(Phillip — J. Chem. Soc. 87, 992, '05.)

Original results in terms of  $\frac{\text{Mols.}}{100}$  per liter.

Gms. Na Salt per Liter.	Gms. Ortho $C_6H_4COOH.NO_2$ per Liter of Solution in:			
	$C_6H_7COONa$	$CH_3COONa$	$HCOONa$	$C_6H_4OH.COONa$
0	7.85	7.85	7.85	7.85
0.5	8.35	8.50	8.60	8.35
1.0	8.90	9.15	9.50	8.70
2	10.0	10.80	11.5	9.4
3	11.2	12.55	13.5	11.0
4	12.4	14.5	15.6	11.5
6	15.2	...	...	...

## SOLUBILITY OF ORTHO NITRO BENZOIC ACID IN AQUEOUS SOLUTIONS OF DEXTROSE, SODIUM CHLORIDE, AND OF SODIUM NITRATE.

Original results in molecular quantities.

(Hoffman and Langbeck — Z. physik. Chem. 51, 412, '05.)

In Dextrose.			In NaCl.			In $NaNO_3$ .		
G. $C_6H_4NO_2$ per 100 cc. Solution.	G. (o) $C_6H_4NO_2COOH$ per 100 g. Solvent.		G. NaCl. per 100 cc. Solution.	G. (o) $C_6H_4NO_2COOH$ per 100 g. Solvent.		G. $NaNO_3$ per 100 cc. Solution.	G. (o) $C_6H_4NO_2COOH$ per 100 g. Solvent.	
	At 25°.	At 35°.		At 25°.	At 35°.		At 25°.	At 35°.
0.0	0.736	1.063	0.117	0.743	1.072	0.170	0.746	1.074
0.36	0.736	1.064	0.195	0.746	1.075	0.284	0.754	1.080
1.80	0.732	1.061	0.585	0.749	1.070	0.851	0.767	1.096
9.50	0.722	1.051	2.425	0.688	0.967	4.255	0.774	1.097
20.00	0.703	1.030	5.80	0.597	0.831	8.510	0.748	1.047

## BENZOIC SULPHINIDE (Saccharine) $C_6H_4<\begin{smallmatrix} SO_2 \\ CO \end{smallmatrix}>NH$ .

100 parts water dissolve 0.4 part at 25° and 4.17 parts at 100°.  
100 parts alcohol dissolve 4 parts at 25° (U. S. P.).

**BENZOPHENONE** (C<sub>6</sub>H<sub>5</sub>)<sub>2</sub>CO.**SOLUBILITY IN AQUEOUS ALCOHOL AND IN OTHER SOLVENTS.**

(Derrien — Compt. rend. 130, 722, '00; Bell — J. Physic. Chem. 9, 550, '05.)

**In Aqueous Alcohol at 40°.**

Wt. % Alcohol in Solvent.	Gms. (C <sub>6</sub> H <sub>5</sub> ) <sub>2</sub> CO per 100 Gms.		Wt. % Alcohol in Solvent.	Gms. (C <sub>6</sub> H <sub>5</sub> ) <sub>2</sub> CO per 100 Gms.	
	Solvent.	Solution.		Solvent.	Solution.
40	2	1.9	67.5	39	28.1
45	5	4.8	70	56	35.9
50	8	8.3	71	67	39.2
55	11	9.9	72	90	47.4
60	16	13.8	72.5	105	51.2
65	28	22.6	73	156	61.0

**In Aqueous Alcohol and other Solvents.**

(Derrien.)

Solvent.	t°.	Gms. (C <sub>6</sub> H <sub>5</sub> ) <sub>2</sub> CO per 100 g. Solvent.	Solvent.	t°.	Gms. (C <sub>6</sub> H <sub>5</sub> ) <sub>2</sub> CO per 100 g. Solvent.
97% Ethyl Alcohol	17	13.5	Benzene	17	76.9
85 cc. 97% Alcohol + 15 cc. H <sub>2</sub> O	"	3.8	Xylene	17.6	38.4
80 " " + 20 "	"	2.2	Nitro Benzene	15.8	58.8
75 " " + 26 "	"	1.3	Chloroform (com.)	16.5	55.5
Methyl Alcohol (pure)	9.8	11.0	Bromoform	17.3	33.3
" "	15.0	14.3	Toluene	17.2	55.5
Acetic Ether (pure)	9.6	19.2	Ligroïne	14.6	6.7
Carbon Bisulphide	16.1	66.6			

**BERYLLIUM HYDROXIDE** Be(OH)<sub>2</sub> (See also Glucinium, page 140).**SOLUBILITY IN AQUEOUS SOLUTIONS OF SODIUM HYDROXIDE.**

(Rubenbauer — Z. anorg. Chem. 30 334, '02.)

Moist Be(OH)<sub>2</sub>, used, solutions shaken 5 hours, temperature probably about 20°.

Per 20 cc. Solution.		Molecular Dilution of the NaOH.	Gms. per 100 cc. Solution.	
Gms. Na.	Gms. Be.		NaOH.	Be(OH) <sub>2</sub> .
0.3358	0.0358	1.37	2.917	0.850
0.6716	0.0882	0.68	5.840	2.094
0.8725	0.1175	0.53	7.585	2.789
1.7346	0.2847	0.27	18.310	6.760

**BERYLLIUM SULPHATE** BeSO<sub>4</sub>.**SOLUBILITY IN WATER.**

(Levi, Malvano — Z. anorg. Chem. 48, 446, '06.)

t°.	Mols. H <sub>2</sub> O per 1 Mol. BeSO <sub>4</sub> .	Gms. BeSO <sub>4</sub> per 100 Gms.		Solid Phase.	t°.	Mols. H <sub>2</sub> O per 1 Mol. BeSO <sub>4</sub> .	Gms. BeSO <sub>4</sub> per 100 Gms.		Solid Phase.
		Water.	Solution.				Water.	Solution.	
31	11.18	52.23	34.32	BeSO <sub>4</sub> .6H <sub>2</sub> O	95.4	6.44	90.63	47.55	BeSO <sub>4</sub> .4H <sub>2</sub> O
50	9.62	60.67	37.77	"	107.2	5.06	115.3	53.58	"
72.2	7.79	74.94	42.85	"	111	4.55	128.3	56.19	"
77.4	7.13	81.87	45.01	"	80	6.89	84.76	45.87	BeSO <sub>4</sub> .2H <sub>2</sub> O
30	13.33	43.78	30.45	BeSO <sub>4</sub> .4H <sub>2</sub> O	91.4	5.97	97.77	49.42	"
40	12.49	46.74	31.85	"	105	4.93	118.4	54.21	"
68	9.42	61.95	38.27	"	119	3.91	149.3	59.88	"
85	7.65	76.30	43.28	"					

# BISMUTH

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## BISMUTH Bi.

### MUTUAL SOLUBILITY OF BISMUTH AND ZINC.

(Spring and Romanoff — Z. anorg. Chem. 13, 34, '96.)

t°.	Upper Layer.		Lower Layer.		t°.	Upper Layer.		Lower Layer.	
	%Bi.	%Zn.	%Bi.	%Zn.		%Bi.	%Zn.	%Bi.	%Zn.
266	86	14	..	..	584	80	20	10	90
419	..	..	3	97	650	77	23	15	85
475	84	16	5	95	750	70	30	27	73
					810-820 (crit. temp.)				

## BISMUTH CHLORIDE BiCl<sub>3</sub>.

100 grams absolute acetone dissolve 17.9 grams BiCl<sub>3</sub> at 18°.

(Naumann — Ber. 37, 4332, 1904.)

## BISMUTH IODIDE BiI<sub>3</sub>.

100 grams absolute alcohol dissolve 3.5 grams BiI<sub>3</sub> at 20°.

(Gott and Muir — J. Chem. Soc. 57, 138, '90.)

100 grams methylene iodide CH<sub>2</sub>I<sub>2</sub> dissolve 0.15 gram BiI<sub>3</sub> at 12°.

(Retgers — Z. anorg. Chem. 3, 343, '93.)

## BISMUTH NITRATE Bi(NO<sub>3</sub>)<sub>3</sub>·5H<sub>2</sub>O.

100 grams acetone dissolve 48.66 grams Bi(NO<sub>3</sub>)<sub>3</sub>·5H<sub>2</sub>O at 0°, and 41.7 grams at 19°.

(von Laszczynski — Ber. 27, 2285, '94.)

## BISMUTH OXIDE Bi<sub>2</sub>O<sub>3</sub>.

### SOLUBILITY OF BISMUTH OXIDE IN AQUEOUS NITRIC ACID AT 20°.

(Rutten and van Bemmelen — Z. anorg. Chem. 30, 386, '02.)

Present in Shaker Flask. Per 1 part Bi <sub>2</sub> O <sub>3</sub> . 3N <sub>2</sub> O <sub>5</sub> ·10H <sub>2</sub> O.	Gms. per 100 Gms. Solution.		Mols. per 100 Mols. H <sub>2</sub> O.			Solid Phase.
	Bi <sub>2</sub> O <sub>3</sub>	N <sub>2</sub> O <sub>5</sub>	Bi <sub>2</sub> O <sub>3</sub>	N <sub>2</sub> O <sub>5</sub>	Ratio Bi <sub>2</sub> O <sub>3</sub> : N <sub>2</sub> O <sub>5</sub> .	
24.4 parts H <sub>2</sub> O	0.321	0.963	0.126	1.61	1:12.8	Bi <sub>2</sub> O <sub>3</sub> ·N <sub>2</sub> O <sub>5</sub> ·H <sub>2</sub> O
3.2 parts H <sub>2</sub> O	6.37	7.17	2.844	13.82	1: 4.8	
Dilute HNO <sub>3</sub>	18.74	15.9	10.50	38.65	1: 3.6	Bi <sub>2</sub> O <sub>3</sub> ·N <sub>2</sub> O <sub>5</sub> ·H <sub>2</sub> O
Dilute HNO <sub>3</sub>	31.48	23.7	27.2	83.8	1: 3.0	
Dilute HNO <sub>3</sub> — 6.13% N <sub>2</sub> O <sub>5</sub>	32.93	24.83	30.15	97.97	1: 3.2	{ Bi <sub>2</sub> O <sub>3</sub> ·N <sub>2</sub> O <sub>5</sub> ·H <sub>2</sub> O and Bi <sub>2</sub> O <sub>3</sub> ·3N <sub>2</sub> O <sub>5</sub> ·10H <sub>2</sub> O
6.816% N <sub>2</sub> O <sub>5</sub>	32.67	24.70	29.70	96.57	1: 3.2	
24.0% N <sub>2</sub> O <sub>5</sub>	24.16	28.25	19.65	98.76	1: 5.0	Bi <sub>2</sub> O <sub>3</sub> ·3N <sub>2</sub> O <sub>5</sub> ·10H <sub>2</sub> O
51.0% N <sub>2</sub> O <sub>5</sub>	11.66	46.62	10.81	186.23	1:17.2	
70.0% N <sub>2</sub> O <sub>5</sub>	20.76	53.75	33.51	355.87	1:10.6	{ Bi <sub>2</sub> O <sub>3</sub> ·3N <sub>2</sub> O <sub>5</sub> ·10H <sub>2</sub> O and Bi <sub>2</sub> O <sub>3</sub> ·3N <sub>2</sub> O <sub>5</sub> ·3H <sub>2</sub> O
	27.85	51.02	51.0	403.0	1: 7.9	
Anyhydrous HNO <sub>3</sub>	8.56	68.28	14.35	492.0	1:34.3	Bi <sub>2</sub> O <sub>3</sub> ·3N <sub>2</sub> O <sub>5</sub> ·3H <sub>2</sub> O
Bi <sub>2</sub> O <sub>3</sub> + "	4.05	74.90	7.45	592.9	1:79.5	

Results are also given for 9°, 30°, and 65°.

**BORIC ACID (Ortho)  $H_2BO_3$ .****SOLUBILITY IN WATER.**

(Ditte — Compt. rend. 85, 1069, 77; Herz and Knoch — Z. anorg. Chem. 41, 319, '04.)

t°.	Gms. $H_2BO_3$ per 100 Gms.		Gms. $B_2O_3$ per 100 Gms. $H_2O$ .	t°.	Gms. $H_2BO_3$ per 100 Gms.		Gms. $B_2O_3$ per 100 Gms. $H_2O$ .
	Water.	Solution.			Water.	Solution.	
0	1.95	1.91	1.1	40	7.0	6.54	3.95
10	2.70	2.63	1.5	50	8.8	8.09	5.08
20	4.0	3.85	2.25	60	11.0	9.91	6.2
25	4.7	4.49	2.65	80	16.8	14.38	9.5
30	5.4	5.12	3.05	100	27.5	21.57	15.52

The above results of Ditte are probably low.

Herz and Knoch find for 13°, 3.845 grams  $H_2BO_3$  per 100 cc. solution, for 20°, 4.909, 25°, 5.593, and 26°, 5.637.Bogdan finds 5.753 grams  $H_2BO_3$  per 100 grams  $H_2O$  at 25°.**SOLUBILITY OF BORIC ACID IN AQUEOUS SOLUTIONS OF HYDROCHLORIC, SULPHURIC, AND NITRIC ACIDS AT 26°.**

(Herz — Z. anorg. Chem. 33, 355, 34, 205, '03.)

Normality of the $H_2SO_4$ , HCl or $HNO_3$ .	Normality of Dissolved $B(OH)_3$ .	Gms. Strong Acid per 100 cc. Solution.	Gms. $B(OH)_3$ per 100 cc. Solution.		
			In HCl.	In $H_2SO_4$ .	In $HNO_3$ .
0	0.91	0	5.64	5.64	5.64
0.5	0.78	5	4.0	4.25	4.50
1.0	0.71	10	3.2	3.6	3.9
2.0	0.58	15	2.45	3.0	3.35
3.0	0.49	20	1.8	2.5	2.9
4.0	0.41	25	...	2.0	2.55
5.0	0.35	30	...	1.55	2.1
6.0	0.26	35	...	...	1.75

The determinations given in the original tables in terms of normal solutions when plotted together lay close to an average curve drawn through them. The figures in the tables here shown were read (and calculated) from the average curve.

**SOLUBILITY OF BORIC ACID IN AQUEOUS SOLUTIONS OF ELECTROLYTES AT 25°.**

(Bogdan — Ann. Scient. Univ. Jassy, 2, 47, '02-'03.)

Gms. Electrolyte per 100 Gms. $H_2O$ .	Grams $H_2BO_3$ per 100 Gms. $H_2O$ in Aq. Solutions of:					
	NaCl.	KCl.	$NaNO_3$ .	$KNO_3$ .	$Na_2SO_4$ .	$K_2SO_4$ .
0	5.75	5.75	5.75	5.75	5.75	5.75
10	5.75	5.80	5.78	5.81	5.88	5.92
20	5.74	5.86	5.81	5.88	6.00	6.10
40	5.72	5.98	5.87	6.04	6.33	6.50
60	5.72	6.12	5.95	6.20	6.70	6.92
80	5.71	6.29	6.02	6.37	7.10	7.40

Interpolated from the original.

100 parts alcohol dissolve 6.5 parts  $H_2BO_3$  at 25° and 23 parts at b. pt. (U. S. P.).

# **BORIC ACID**

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## **SOLUBILITY OF BORIC ACID IN AQUEOUS SOLUTIONS OF UREA, ACETONE, AND OF PROPYL ALCOHOL AT 25°.**

(Bogdan.)

Grams of $\text{CO(NH}_2)_2$ or of $\text{C}_3\text{H}_7\text{OH}$ per 100 Gms. $\text{H}_2\text{O}$ .	Gms. $\text{H}_3\text{BO}_3$ per 100 g. $\text{H}_2\text{O}$ in Aq. Solutions of:		
	$\text{CO(NH}_2)_2$	$\text{C}_3\text{H}_7\text{CO}$	$\text{C}_3\text{H}_7\text{OH}$
0	5.75	5.75	5.75
10	5.84	5.84	5.80
20	5.93	5.93	5.85
40	6.13	6.12	5.94
60	6.31	6.29	6.03

## **SOLUBILITY OF BORIC ACID IN AQUEOUS SOLUTIONS OF:**

**Acetic Acid at 26°.**

(Herz — Z. anorg. Chem. 34, 205, '03.)

**Acetone at 20°.**

(Herz and Knoch — *Ibid.* 41, 319, '04.)

Normality of Solutions. $\text{CH}_3\text{COOH}$ . $\text{B(OH)}_3$ .		Gms. per 100 cc. Solution. $\text{CH}_3\text{COOH}$ . $\text{B(OH)}_3$ .		cc. Acetone per 100 cc. Solvent.	B(OH) <sub>3</sub> per 100 cc. Solution. Millimols. Grams.	
$\text{CH}_3\text{COOH}$ .	$\text{B(OH)}_3$ .	$\text{CH}_3\text{COOH}$ .	$\text{B(OH)}_3$ .		Millimols.	Grams.
0	0.91	0	5.64	0	79.15	4.91
1	0.82	5	4.7	20	81.71	5.07
2	0.65	10	4.2	30	83.35	5.17
4	0.42	20	3.0	40	82.72	5.13
6	0.25	30	2.0	50	81.62	5.06
				60	76.40	4.74
				70	67.62	4.19
				80	55.05	3.41
				100	8.06	0.50

## **SOLUBILITY OF BORIC ACID IN:**

**Pure Glycerine (Sp.Gr. = 1.260  
at 15.5°).**

(Hooper — Pharm. J. Trans. [3] 13, 258, '82.)

**Aq. Solutions of Glycerine  
at 25°.**

(Herz and Knoch — Z. anorg. Chem. 45, 268, '05.)

t°.	Gms. $\text{B}_2\text{O}_3$ · $3\text{H}_2\text{O}$ per 100 cc. Glycerine	Gms. B(OH) <sub>3</sub> per 100 Gms. Glycerine. Solution.		Wt. % Glycerine in Solvent.	Millimols B(OH) <sub>3</sub> per 100 cc. Sol.	Sp. Gr. at 25°.	Gms. B(OH) <sub>3</sub> per 100	
		Glycerine.	Solution.				cc. Solution.	Gms. So- lution.
0	20	15.87	13.17	0	90.1	1.017	5.59	5.50
10	24	19.04	16.00	7.15	90.1	1.038	5.59	5.38
20	28	22.22	18.21	20.44	90.6	1.063	5.62	5.28
30	33	26.19	20.75	31.55	92.9	1.090	5.76	5.29
40	38	30.16	23.17	40.95	97.0	1.113	6.02	5.41
50	44	34.92	25.95	48.7	103.0	1.133	6.39	5.64
60	50	39.68	28.41	69.2	140.2	1.187	8.69	7.32
70	56	44.65	30.72	100.0	390.3	1.272	24.20	19.02
80	61	48.41	32.61					
90	67	53.18	34.70					
100	72	57.14	36.36					

**DISTRIBUTION OF BORIC ACID BETWEEN WATER AND AMYL ALCOHOL  
AT 25°.**

(Fox — Z. anorg. Chem. 35, 130, '03.)

Millimols B(OH) <sub>3</sub> in		Gms. B(OH) <sub>3</sub> in 100 cc.		Millimols B(OH) <sub>3</sub> in		Gms. B(OH) <sub>3</sub> in 100 cc	
Aq. Layer.	Alcoholic Layer.	Aq. Layer.	Alcoholic Layer.	Aq. Layer.	Alcoholic Layer.	Aq. Layer.	Alcoholic Layer.
265.8	76.6	1.648	0.475	87.9	33.2	0.545	0.206
196.5	59.5	1.219	0.369	75.2	22.7	0.466	0.141
159.6	47.5	0.990	0.294	64.6	19.76	0.400	0.123
126.0	37.1	0.781	0.230				

**BORIC ACID (Tetra) H<sub>2</sub>B<sub>4</sub>O<sub>7</sub>.**

100 grams water dissolve 2.69 grams H<sub>2</sub>B<sub>4</sub>O<sub>7</sub> at 15°, Sp. Gr. = 1.015.

(Gerlach — Z. anal. Chem. 28, 473, '89.)

**BORON TRI-FLUORIDE BF<sub>3</sub>.**

1 cc. H<sub>2</sub>O absorbs 1.057 cc. BF<sub>3</sub> at 0° and 762 mm., 1 cc. conc. H<sub>2</sub>SO<sub>4</sub> (Sp. Gr. 1.85) absorbs 50 cc. BF<sub>3</sub>.

**BROMINE Br.**

**SOLUBILITY IN WATER.**

(Winkler — Chem. Ztg. 23, 687, '99; Roozeboom — Rec. trav. chim. 3, 29, 59, 73, 84, '84; Dancer — J. Chem. Soc. 15, 477, '62; at 15°, Dietze — Pharm. Ztg. 43, 290, '98.)

t°.	Grams Bromine per 100 Grams.				"Absorption Coefficient." *	"Solubility." *
	Water.		Solution.			
	(W.)	(R. D. & D.)	(W.)	(R. D. & D.)		
0	4.17	4.22	3.98	4.05	60.5	43.1
5	3.92	3.7	3.77	3.57	45.8	32.4
10	3.74	3.4	3.61	3.29	35.1	24.8
15	3.65	3.25	3.52	3.15	27.0	19.0
20	3.58	3.20	3.46	3.10	21.3	14.8
25	3.48	3.17	3.36	3.07	17.0	11.7
30	3.44	3.13	3.32	3.03	13.8	9.4
40	3.45	...	3.33	...	9.4	6.2
50	3.52	...	3.40	...	6.5	4.0
60	...	...	...	...	4.9	2.8
80	...	...	...	...	3.0	1.1

\* For "Absorption Coefficient" a and "Solubility" g, of Bromine Vapor in water, see Acetylene, page 9.



# BROMINE

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## SOLUBILITY OF BROMINE IN AQUEOUS SOLUTIONS OF POTASSIUM SULPHATE, SODIUM SULPHATE, AND OF SODIUM NITRATE AT 25°.

(Jakowkin — Z. physik. Chem. 20, 38, '96.)

Normality of Salt Solution.	In $K_2SO_4$ Gms. per Liter.		In $Na_2SO_4$ Gms. per Liter.		In $NaNO_3$ Gms. per Liter.	
	$K_2SO_4$	Br.	$Na_2SO_4$	Br.	$NaNO_3$	Br.
$\frac{1}{1}$	91.18	25.14	63.55	25.07	85.09	28.80
$\frac{1}{2}$	45.59	29.44	31.77	29.20	42.54	31.35
$\frac{1}{3}$	22.79	31.46	15.88	31.33	21.27	32.62
$\frac{1}{4}$	11.39	32.70	7.94	32.94	10.63	33.33
$\frac{1}{8}$	5.69	33.10	3.97	32.26	5.31	33.74

## SOLUBILITY OF BROMINE IN NORMAL AQUEOUS SALT SOLUTIONS AT 25°.

(McLauchlan — Z. physik. Chem. 44, 617, '03.)

Salt.	Gms. Salt per Liter.	Normality of Dissolved Br.	Gms. Br. per Liter.	Salt.	Gms. Salt per Liter.	Normality of Dissolved Br.	Gms. Br. per Liter.
Water	0.0	0.424	33.95	$NH_4NO_3$	80.11	0.688	55.15
$Na_2SO_4$	63.55	0.286	23.9	NaCl	58.50	0.701	55.90
$K_2SO_4$	91.18	0.310	24.8	KCl	74.60	0.718	57.40
$(NH_4)_2SO_4$	70.04	0.971	77.7	$NH_4Cl$	53.52	1.028	82.2
$NaNO_3$	85.09	0.3495	28.0	$CH_3COONH_4$	77.09	4.26	340.5
$KNO_3$	101.19	0.362	28.95	$H_2SO_4^*$	49.03	0.366	29.26

\* Wildeman.

## SOLUBILITY OF BROMINE IN AQUEOUS POTASSIUM BROMIDE SOLUTIONS.

(Worley — J. Chem. Soc. 87, 1107, '05; see also Wildeman — Z. physik. Chem. 11, 421, '93.)

Gram Mols. KBr per Liter.	Gms. KBr per Liter.	Br. per Liter Dissolved at 26.5°.		Br. per Liter Dissolved at 18.5°.	
		G. Mols.	Grams.	G. Mols.	Grams.
0.00	0.00	0.4282	34.23	0.4448	35.56
0.02	2.18	0.4671	37.35	0.4823	38.56
0.04	4.38	0.5101	40.79	0.5243	41.91
0.06	6.55	0.5530	44.21	0.5668	45.31
0.08	8.76	0.5920	47.33	0.6059	48.44
0.10	10.91	0.6488	51.87	0.6533	52.23
0.20	21.82	0.8591	68.69	0.8718	69.69
0.40	43.82	1.2704	101.60	1.3124	104.90
0.60	65.46	1.6717	133.70	1.7712	141.60
0.80	87.64	2.1029	168.10	2.2354	178.70
0.90	98.19	2.3349	186.20	2.4851	198.70

100 grams saturated solution of Bromine in Carbon Bisulphide contain 45.4 grams Br at - 95°, 39.0 grams at - 110.5°, and 36.9 grams at - 116°.

(Arctowski — Z. anorg. Chem. 11, 274, '95-'96.)

## DISTRIBUTION OF BROMINE AT 25° BETWEEN WATER AND:

(Jakowkin — Z. physik. Chem. 18, 588, '95.)

Carbon Bisulphide.		Bromoform.		Carbon Tetra Chloride.	
Gms. Br. per Liter of:		Gms. Br. per Liter of:		Gms. Br. per Liter of:	
Aq. Layer.	CS <sub>2</sub> Layer.	Aq. Layer.	CHBr <sub>3</sub> Layer.	Aq. Layer.	CCl <sub>4</sub> Layer.
0.5	36	0.5	33	0.5	15
1	80	1	66	1	28
2	163	2	136	2	60
3	240	3	206	3	90
4	330	4	276	4	123
5	420	5	346	5	156
6	515	6	415	6	190
7	620	...	...	8	260
				10	340
				12	430
				14	520

**BRUCINE** C<sub>21</sub>H<sub>20</sub>(OCH<sub>3</sub>)<sub>2</sub>N<sub>2</sub>O<sub>2</sub>·4H<sub>2</sub>O.

## SOLUBILITY IN SEVERAL SOLVENTS AT 18°–22°.

(Müller — Apoth. Ztg. 18, 232, '03.)

Solvent.	Gms. Brucine per 100 Gms. Solution.	Solvent.	Gms. Brucine per 100 Gms. Solution.
Water	0.0563	Petroleum Ether	0.088
Ether	0.749	Carbon Tetra Chloride	0.078
Acetic Ether	4.255	Carbon Tetra Chloride*	1.937
Benzene	1.11	Glycerine	2.2

\* Schindelmeyer — Chem. Ztg. 25, 129, '01.

**BUTANE** C<sub>4</sub>H<sub>10</sub>.

## SOLUBILITY IN WATER AT t°. AND 760 MM.

t°.	0°	4°	10°	15°	20°
Vols. C <sub>4</sub> H <sub>10</sub> per 100 vols. H <sub>2</sub> O	3.147	2.77	2.355	2.147	2.065

**Iso BUTYL ACETATE**, etc.

## SOLUBILITY IN WATER.

(Traube — Ber. 17, 2304, '84; at 20°, Vaubel — J. pr. Chem. 59, 30, '99.)

t°.	Compound.	Grams Com- pound per 100 Grams H <sub>2</sub> O.
22	Iso Butyl Acetate	0.5
22	Iso Butyl Formate	1.0
20	Normal Butyric Aldehyde	3.6
20	Iso Butyric Aldehyde	10.0

# BUTYL ACETATE

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## SOLUBILITY OF BUTYL ACETATE AND OF BUTYL FORMATE IN MIXTURES OF ALCOHOL AND WATER.

(Bancroft — Calc. from Pfeiffer — Phys. Rev. 3, 205, '95-'96.)

cc. Alcohol in Mixture.	cc. H <sub>2</sub> O added to cause separation of a second phase in mixtures of the given quantity of alcohol and 3 cc. portions of:	
	Butyl Formate.	Butyl Acetate.
3	3.45	2.08
6	8.83	6.08
9	14.75	10.46
12	21.45	15.37
15	29.65	20.42
18	39.0	25.60
21	51.8	31.49
24	∞	37.48
27		43.75
30		50.74
33		59.97

100 cc. H<sub>2</sub>O dissolve 0.7 cc. iso butyl acetate at 25° (Bancroft).

# Iso BUTYRIC ACID (CH<sub>3</sub>)<sub>2</sub>CH.COOH.

## SOLUBILITY IN WATER.

(Rothmund — Z. physik. Chem. 26, 475, '98.)

Synthetic Method used, see Note, p. 9.

t°.	Gms. Iso Butyric Acid per 100 Gms.	
	Aq. Layer.	Iso Butyric Ac. Layer.
5	16.4	73.4
10	17.5	68.5
15	19.4	62.5
20	22.6	53.9
22	25.8	49.6
24.7 (crit. temp.)		36.3

# CADMIUM BROMIDE CdBr<sub>2</sub>.

## SOLUBILITY IN WATER.

(Dietz — Ber. 32, 95, '99; Z. anorg. Chem. 20, 260, '99; Wiss. Abh. p.t. Reichanstalt, 3, 433, '00; see also Eder — Dangler polyt. J. 221, 189, '76; Etard — Ann. chim. phys. [7] 2, 536, '94.)

t°.	Gms. CdBr <sub>2</sub>		Solid Phase.	t°.	Gms. CdBr <sub>2</sub>		Solid Phase.
	per 100 Gms. Solution.	Mols. CdBr <sub>2</sub> per 100 Mols. H <sub>2</sub> O.			per 100 Gms. Solution.	Mols. CdBr <sub>2</sub> per 100 Mols. H <sub>2</sub> O.	
0	37.92	4.04	CdBr <sub>2</sub> .4H <sub>2</sub> O	40	60.65	10.20	CdBr <sub>2</sub> .H <sub>2</sub> O
18	48.90	6.21	"	45	60.75	10.24	"
30	56.90	8.73	"	60	61.10	10.39	"
38	61.84	10.73	"	80	62.29	10.48	"
35	60.29	10.05	CdBr <sub>2</sub> .H <sub>2</sub> O	100	61.63	10.63	"

Density of saturated solution at 18° = 1.683.

**SOLUBILITY OF CADMIUM BROMIDE IN ALCOHOL, ETHER, AND  
IN ACETONE.**

100 gms. sat. solution of  $\text{CdBr}_2 \cdot 4\text{H}_2\text{O}$  in abs. alcohol contain 20.93 gms.  $\text{CdBr}_2$  at  $15^\circ$  (Eder).

100 gms. sat. solution of  $\text{CdBr}_2 \cdot 4\text{H}_2\text{O}$  in abs. ether contain 0.4 gm.  $\text{CdBr}_2$  at  $15^\circ$  (Eder).

100 gms. absolute acetone dissolve 1.559 gms.  $\text{CdBr}_2$  at  $18^\circ$ .

(Naumann — Ber. 37, 4332, '04.)

**CADMIUM (Mono) AMMONIUM BROMIDE**  $\text{CdBr}_2 \cdot \text{NH}_4\text{Br}$ .

**SOLUBILITY IN WATER.**

(Rimbach — Ber. 38, 1553, '05; Eder.)

$t^\circ$ .	100 Grams Solution contain Gms.			Atomic Relation.			G. $\text{CdBr}_2 \cdot \text{NH}_4\text{Br}$ per 100 Gms. Solution.
	Cd.	Br.	$\text{NH}_4$ .	Cd	Br	$\text{NH}_4$ .	
1.0	16.33	34.87	2.63	1	3	1	53.82
14.8	17.40	37.15	2.80	1	3	1	58.01
52.2	19.79	42.38	3.21	1	3	1	65.31
110.1	22.99	49.17	3.72	1	3	1	75.98

100 gms. sat. solution of  $\text{CdBr}_2 \cdot \text{NH}_4\text{Br}$  in abs. alcohol contain 15.8 gms. double salt at  $15^\circ$  (Eder).

100 gms. sat. solution of  $\text{CdBr}_2 \cdot \text{NH}_4\text{Br}$  in abs. ether contain 0.36 gm. double salt at  $15^\circ$  (Eder).

**CADMIUM (Tetra) AMMONIUM BROMIDE**  $\text{CdBr}_2 \cdot 4\text{NH}_4\text{Br}$ .

**SOLUBILITY IN WATER.**

(Rimbach.)

The double salt is decomposed by water at temperatures below  $160^\circ$ .

$t^\circ$ .	100 Gms. Solution contain Gms.			Atomic Relation in Sol.			Atomic Relation in Solid.		
	Cd.	Br.	$\text{NH}_4$ .	Cd	Br	$\text{NH}_4$ .	Cd	Br	$\text{NH}_4$ .
0.8	14.72	50.46	6.67	1	4.82	2.82	1	10.02	8.02
13.0	14.95	51.48	6.85	1	4.85	2.85	1	11.57	9.57
44.0	15.01	53.85	7.35	1	5.04	3.04	1	6.84	4.84
76.4	14.6	54.28	7.80	1	5.32	3.32	1	6.63	4.63
123.5	15.5	59.50	8.45	1	5.38	3.38	1	7.40	5.40
160.0	14.7	62.67	9.43	1	5.99	3.99	1	6.03	4.03

**CADMIUM (Mono) POTASSIUM BROMIDE**  $\text{CdBr}_2 \cdot \text{KBr} \cdot \text{H}_2\text{O}$ .

**SOLUBILITY IN WATER.**

(Rimbach; see also Eder.)

$t^\circ$ .	100 Gms. Solution contain Gms.			Atomic Relation in Sol.			Gms. $\text{CdBr}_2 \cdot \text{KBr}$ per 100 Gms. Solution.
	Cd.	Br.	K.	Cd	Br	K.	
0.4	15.41	33.0	5.42	1	3	1	53.63
15.8	16.85	35.96	5.86	1	3	1	58.61
50.0	19.58	41.86	6.85	1	3	1	67.87
112.5	22.24	48.28	8.14	0.98	3	1.03	78.11

**CADMIUM BROMIDE** 72

**CADMIUM Tetra POTASSIUM BROMIDE** is decomposed by water at ordinary temperatures.

**CADMIUM (Mono) RHUBIDIUM BROMIDE**  $\text{CdBr}_3 \cdot \text{RbBr}$ .

SOLUBILITY IN WATER.

(Rimbach.)

t°.	100 Gms. Solution contain Gms.			Atomic Relation in Sol.			Gms. $\text{CdBr}_3 \cdot \text{RbBr}$ per 100 Gms. Solution.
	Cd.	Br.	Rb.	Cd :	Br :	Rb.	
0.4	8.37	17.93	6.43	1	3	1.01	32.65
14.5	10.72	23.02	8.30	0.99	3	1.01	41.87
49.2	15.01	32.13	11.51	1	3	1	58.54
107.5	19.65	41.12	14.06	1.02	3	0.96	75.77

**CADMIUM (Tetra) RHUBIDIUM BROMIDE**  $\text{CdBr}_3 \cdot 4\text{RbBr}$ .

SOLUBILITY IN WATER.

(Rimbach.)

t°.	100 Gms. Solution contain Gms.			Atomic Relation in Sol.			Gms. $\text{CdBr}_3 \cdot 4\text{RbBr}$ per 100 Gms. Solution.
	Cd	Br	Rb.	Cd :	Br :	Rb.	
0.5	5.70	24.94	17.97	0.98	6	4.05	47.95
13.5	6.55	28.74	20.74	0.97	6	4.05	55.17
51.5	8.25	35.51	25.39	0.99	6	4.02	68.82
114.5	9.50	40.67	29.00	1.00	6	4.0	79.04

**CADMIUM (Mono) SODIUM BROMIDE**  $\text{CdBr}_2 \cdot \text{NaBr} \cdot \frac{1}{2}\text{H}_2\text{O}$ .

SOLUBILITY IN WATER, ETC., AT 15°.

(Eder—Ding. polyt. J. 221, 189, '76.)

Solvent.	Gms. $\text{CdBr}_2 \cdot \text{NaBr}$ per 100 Gms.		Solid Phase.
	Solution.	Solvent.	
Water	49.0	96.1	$\text{CdBr}_2 \cdot \text{NaBr} \cdot \frac{1}{2}\text{H}_2\text{O}$
Absolute Alcohol	21.2	27.0	"
Absolute Ether	0.52	0.53	"

**CADMIUM CHLORATE**  $\text{Cd}(\text{ClO}_3)_2 \cdot 2\text{H}_2\text{O}$ .

SOLUBILITY IN WATER.

(Meusser—Ber. 35, 1422, '02.)

t°.	Gms. $\text{Cd}(\text{ClO}_3)_2$ per 100 Gms. Solution.	Mols. $\text{Cd}(\text{ClO}_3)_2$ per 100 Mols. $\text{H}_2\text{O}$ .	Solid Phase.	t°.	Gms. $\text{Cd}(\text{ClO}_3)_2$ per 100 Gms. Solution.	Mols. $\text{Cd}(\text{ClO}_3)_2$ per 100 Mols. $\text{H}_2\text{O}$ .	Solid Phase.
-20	72.18	22.47	$\text{Cd}(\text{ClO}_3)_2 \cdot 2\text{H}_2\text{O}$	18	76.36	27.98	$\text{Cd}(\text{ClO}_3)_2 \cdot 2\text{H}_2\text{O}$
-15	72.53	22.87	"	49	80.08	34.82	"
0	74.95	25.92	"	65	82.95	42.14	"

Density of the saturated solution at 18° = 2.284.

## SOLUBILITY IN WATER.

(Dietz — W. Abh. p. t. Reichsanstalt 3, 433, '00; above 100°, Etard — Ann. chim. phys. [7] 2, 536, '94.)

t°.	G. CdCl <sub>2</sub> per 100 Gms. Solution.	Mols. CdCl <sub>2</sub> per 100 Mols. H <sub>2</sub> O.	Solid Phase.	t°.	G. CdCl <sub>2</sub> per 100 Gms. Solution.	Mols. CdCl <sub>2</sub> per 100 Mols. H <sub>2</sub> O.	Solid Phase.
-9	43.58	7.5	CdCl <sub>2</sub> ·4H <sub>2</sub> O	+10	57.47	13.3	CdCl <sub>2</sub> ·H <sub>2</sub> O
0	49.39	9.6		20	57.35	13.2	
+10	55.58	12.3		40	57.51	13.3	
15	59.12	14.2		60	57.71	13.4	
-10	44.35	7.8	CdCl <sub>2</sub> ·2½H <sub>2</sub> O (monoclinic)	80	58.41	13.8	
0	47.37	9.0		100	59.52	14.4	
+18	52.53	10.9		150	64.8		
30	56.91	12.8		200	72.0		
36	57.91	13.5		270	77.7		

Density of saturated solution at 18° = 1.741.

100 gms. abs. ethyl alcohol dissolve 1.52 gms. CdCl<sub>2</sub> at 15°.5.100 gms. abs. methyl alcohol dissolve 1.71 gms. CdCl<sub>2</sub> at 15°.5.

(de Bruyn — Z. physik. Chem. 10, 783, '92.)

CADMIUM AMMONIUM CHLORIDE CdCl<sub>2</sub>·NH<sub>4</sub>Cl.

## SOLUBILITY IN WATER.

(Rimbach — Ber. 30, 3075, 1897.)

t°.	100 Gms. Solution contain Gms.			Gms. CdCl <sub>2</sub> ·NH <sub>4</sub> Cl per 100 Gms.	
	Cd.	Cl.	NH <sub>4</sub> .	Solution.	Water.
2.4	14.26	13.44	2.24	29.94	42.74
16.0	15.82	15.07	2.56	33.45	50.26
41.2	18.61	17.46	2.89	38.96	63.83
63.8	20.92	19.73	3.34	43.99	78.54
105.9	24.70	23.52	4.01	52.23	109.33

CADMIUM (Tetra) AMMONIUM CHLORIDE CdCl<sub>2</sub>·4NH<sub>4</sub>Cl.

## IN CONTACT WITH WATER.

The salt is decomposed in aqueous solution.

(Rimbach.)

t°.	100 Gms. Solution contain Gms.			Atomic Relation in Solution.		
	Cd.	Cl.	NH <sub>4</sub> .	Cd	Cl	NH <sub>4</sub> .
3.9	5.75	18.17	7.37	1	9.96	7.96
16.1	6.96	20.26	7.97	1	9.20	7.13
40.2	9.91	23.84	8.92	1	7.61	5.61
58.5	12.50	26.53	9.35	1	6.71	4.66
112.9	16.66	31.79	10.78	1	6.02	4.02
113.9	16.51	32.71	11.30	1	6.26	4.26

## SOLUBILITY OF MIXTURES OF CADMIUM TETRA AMMONIUM CHLORIDE AND CADMIUM AMMONIUM CHLORIDE IN WATER.

(Rimbach — Ber. 35, 1300, '02.)

t°.	100 Gms. Solution contain Gms.			Atomic Relation.			Solid Phase, Mol. per cent of:	
	Cd.	Cl.	NH <sub>4</sub> .	Cd	Cl	NH <sub>4</sub> .	CdCl <sub>2</sub> ·NH <sub>4</sub> Cl.	CdCl <sub>2</sub> ·4NH <sub>4</sub> Cl.
1.1	5.34	17.62	7.27	1	10.47	8.50	49.6	50.4
14.0	7.12	19.86	7.84	1	8.84	6.87	47.0	53.0
40.7	10.24	23.82	8.85	1	7.37	5.37	77.0	23.0
58.5	12.50	26.53	9.35	1	6.71	4.66	...	...

# CADMIUM CHLORIDE

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## SOLUBILITY OF MIXTURES OF CADMIUM TETRA AMMONIUM CHLORIDE AND AMMONIUM CHLORIDE IN WATER.

(Rimbach.)

t°.	100 Gms. Solution contain Gms.			Atomic Relation.			Solid Phase, Mol. per cent of:	
	Cd.	Cl.	NH.	Cd	Cl	NH <sub>4</sub> .	NH <sub>4</sub> Cl.	CdCl <sub>2</sub> .4NH <sub>4</sub> Cl.
1.0	2.82	17.11	7.82	1	19.21	17.28	59.0	41.0
13.2	2.76	18.84	8.71	1	21.62	19.62	74.0	26.0
40.1	3.16	22.56	10.49	1	22.65	20.74	71.0	29.0
58.2	3.51	25.21	11.72	1	22.79	20.89	69.0	31.0

# CADMIUM BARIUM CHLORIDE 2(CdCl<sub>2</sub>).BaCl<sub>2</sub>.5H<sub>2</sub>O.

## SOLUBILITY IN WATER.

(Rimbach — Ber. 30, 3083, '97.)

t°.	100 Gms. Solution contain Gms.			Gms. 2(CdCl <sub>2</sub> ).BaCl <sub>2</sub> per 100 Gms.	
	Cd.	Cl.	Ba.	Solution.	Water.
22.6	17.71	16.89	11.0	45.60	83.82
41.3	19.22	18.15	11.77	49.14	96.62
53.9	19.85	18.75	12.41	51.04	104.25
62.2	20.59	19.66	12.83	53.08	113.13
69.5	21.20	20.18	13.09	54.47	119.64
107.2	24.25	23.23	14.90	62.38	165.85

# CADMIUM BARIUM CHLORIDE CdCl<sub>2</sub>.BaCl<sub>2</sub>.4H<sub>2</sub>O.

## SOLUBILITY IN WATER.

(Rimbach.)

t°.	100 Gms. Solution contain Gms.			Gms. CdCl <sub>2</sub> .BaCl <sub>2</sub> per 100 Gms.	
	Cd.	Cl.	Ba.	Solution.	Water.
22.5	11.98	15.19	14.71	41.88	72.06
32.9	12.40	16.18	16.09	44.67	80.73
41.4	13.05	16.95	16.81	46.81	88.01
53.4	13.96	18.21	18.13	50.30	101.21
62.0	14.73	18.81	18.74	52.28	109.56
97.8	17.57	22.48	22.00	62.05	163.50
108.3	18.53	23.51	22.79	64.83	184.33
109.2	18.67	23.69	29.95	65.31	188.27

# CADMIUM MAGNESIUM CHLORIDE 2(CdCl<sub>2</sub>).MgCl<sub>2</sub>.12H<sub>2</sub>O.

## SOLUBILITY IN WATER.

(Rimbach.)

t°.	100 Gms. Solution contain Gms.			Gms. 2(CdCl <sub>2</sub> ).MgCl <sub>2</sub> per 100 Gms.	
	Cd.	Cl.	Mg.	Solution.	Water.
2.4	22.14	21.06	2.41	45.61	83.86
20.8	24.30	22.80	2.55	49.69	98.77
45.5	26.24	24.55	2.72	53.51	115.10
67.2	28.45	26.71	2.98	58.14	138.90
121.8	31.84	30.20	3.44	65.48	189.69

**CADMIUM (Mono) RHUBIDIUM CHLORIDE**  $\text{CdCl}_2 \cdot \text{RbCl}$ .**SOLUBILITY OF CADMIUM MONO RHUBIDIUM CHLORIDE IN WATER.**  
(Rimbach — Ber. 35, 1303, '02.)

t°.	100 Gms. Solution contain Gms.			Gms. $\text{CdCl}_2 \cdot \text{RbCl}$ per 100 Gms.	
	Cd.	Cl.	Rb.	Solution.	Water.
1.2	4.80	4.53	3.63	12.97	14.90
14.5	6.20	5.88	4.75	16.80	20.19
41.4	9.34	8.86	7.14	25.31	33.89
57.6	11.40	10.78	8.63	30.83	44.58
103.9	17.14	16.37	13.39	46.62	87.36

**CADMIUM (Tetra) RHUBIDIUM CHLORIDE**  $\text{CdCl}_2 \cdot 4\text{RbCl}$ .**IN CONTACT WITH WATER.**

(Rimbach.)

The double salt decomposes to  $\text{CdCl}_2 \cdot \text{RbCl}$  and  $\text{RbCl}$ .

t°.	100 Gms. Solution contain Gms.			Atomic Relation.			Solid Phase, Mol. per cent of:	
	Cd.	Cl.	Rb.	Cd	Cl	Rb.	$\text{CdCl}_2 \cdot \text{RbCl}$	$\text{CdCl}_2 \cdot 4\text{RbCl}$
0.7	0.65	6.52	14.73	1	31.88	29.88	30	70
8.8	1.07	7.37	16.13	1	21.89	19.89	24	76
13.8	1.32	7.86	16.93	1	18.88	16.83	16	84
42.4	3.21	11.35	22.45	1	11.21	9.21	14	86
59.0	4.61	13.41	25.31	1	9.23	7.23	33	67
108.4	8.94	18.57	31.15	1	6.57	4.59	..	..

**SOLUBILITY OF MIXTURES OF  $\text{CdCl}_2 \cdot 4\text{RbCl}$  AND  $\text{RbCl}$  IN WATER.**  
(Rimbach.)

t°.	100 Gms. Solution contain Gms.			Atomic Relation.			Solid Phase, Mol. per cent of:	
	Cd.	Cl.	Rb.	Cd	Cl	Rb.	$\text{CdCl}_2 \cdot 4\text{RbCl}$	$\text{RbCl}$
0.4	..	12.86	30.97	..	1	1	55	45
14.8	..	13.62	32.81	..	1	1	67	33
17.9	..	14.0	33.71	..	1	1	80	20

**THE EFFECT OF THE PRESENCE OF  $\text{HCl}$ ,  $\text{CaCl}_2$ , AND OF  $\text{LiCl}$  UPON THE DECOMPOSITION OF CADMIUM TETRA RHUBIDIUM CHLORIDE BY WATER AT 16°.**

(Rimbach — Ber. 38, 1570, '05.)

100 Gms. Solution contain Gms.					Mols. per 100 Mols. $\text{H}_2\text{O}$ .		Molecular Ratio.	
Total Cl.	Cl.	$\text{HCl}$ .	Cd.	Rb.	$\text{CdCl}_2$ .	$\text{RbCl}$ .	$\text{HCl}$ .	$\text{CdCl}_2 : \text{RbCl}$ .
36.44	0.84	36.61	0.41	1.39	0.109	0.483	29.76	1 4.43
28.45	0.80	28.44	0.35	1.38	0.082	0.422	20.35	1 5.15
12.09	3.24	9.11	0.69	6.74	0.139	1.772	5.60	1 12.75
	$\text{CaCl}_2$ .						$\text{CaCl}_2$ .	
14.98	7.56	20.91	0.73	2.80	0.159	0.799	4.59	1 5.04
12.70	5.77	15.96	0.77	4.87	0.163	1.353	3.41	1 8.31
10.85	3.78	14.47	1.00	8.51	0.211	2.365	2.24	1 11.22
9.08	1.84	5.10	1.24	12.14	0.262	3.385	1.09	1 12.92
	$\text{LiCl}$ .						$\text{LiCl}$ .	
26.49	4.87	29.40	0.56	3.871	0.139	1.271	19.40	1 9.13
20.37	3.33	20.11	0.52	7.84	0.122	2.433	12.54	1 19.88

See Note on next page.



# **CADMIUM CHLORIDE** 76

## **CADMIUM (Mono) POTASSIUM CHLORIDE** $\text{CdCl}_2 \cdot \text{KCl} \cdot \text{H}_2\text{O}$ .

### SOLUBILITY IN WATER.

(Rimbach — Ber. 30, 3079, '97; see also Croft — Phil. Mag. [3] 21, 356, '42.)

t°.	100 Gms. Solution contain Gms.			Gms. $\text{CdCl}_2 \cdot \text{KCl}$ per 100 Gms.	
	Cd.	Cl.	K.	Solution.	Water.
2.6	9.53	9.03	3.31	21.87	27.99
15.9	11.63	10.98	3.99	26.60	36.24
41.5	15.47	14.73	5.45	35.66	55.34
60.6	17.68	16.80	6.20	40.67	68.55
105.1	22.46	21.34	7.87	51.67	106.91

## **CADMIUM (Tetra) POTASSIUM CHLORIDE** $\text{CdCl}_2 \cdot 4\text{KCl}$ .

### IN CONTACT WITH WATER.

(Rimbach.)

The double salt is decomposed when dissolved in water at ordinary temperature.

t°.	100 Grams Solution contain Gms.		
	Cd.	Cl.	K.
4	3.64	9.84	8.31
23.6	5.66	14.02	11.52
50.2	9.10	18.09	13.60
108.9	11.94	23.11	17.16

NOTE. — The effect of the presence of certain chlorides upon the decomposition of cadmium tetra potassium chloride by water at 16° was investigated by Rimbach in a manner similar to that used in the case of cadmium tetra rhubidium chloride (see preceding page). The results, which show the extent to which increasing amounts of the several chlorides force back the decomposition of the double salt, were plotted on cross-section paper, and the points at which the decomposition was prevented, were determined by interpolation. These values which show the minimum amount of the added chlorides which must be present to insure the crystallization of the pure double salt are shown in the following table.

Added Chloride.	Mols. per 100 Mols. $\text{H}_2\text{O}$ .			Density of Solutions.	Mols. per Liter of Solution.		
	$\text{CdCl}_2$ .	KCl.	Added Chloride.		$\text{CdCl}_2$ .	KCl.	Added Chloride.
HCl	0.074	0.206	19.80	1.1403	0.033	0.132	8.828
LiCl	0.344	1.376	9.30	1.1380	0.166	0.663	4.483
$\text{CaCl}_2$	0.544	2.176	3.80	1.2333	0.270	1.808	1.887
KCl	1.034	6.514*	2.378	1.214	0.507	3.195*	1.167

\* Total.

## **CADMIUM CYANIDE** $\text{Cd}(\text{CN})_2$ .

100 gms.  $\text{H}_2\text{O}$  dissolve 1.7 gms.  $\text{Cd}(\text{CN})_2$ , at 15°.

(Joannis — Ann. chim. phys. [5] 26, 480, '82.)

**CADMIUM FLUORIDE**  $\text{CdF}_2$ .

## SOLUBILITY IN WATER.

100 cc. saturated aqueous solution contain 4.36 gms.  $\text{CdF}_2$  at  $25^\circ$ .

(Jager — Z. anorg. Chem. 27, 34, '01.)

**CADMIUM HYDROXIDE**  $\text{Cd}(\text{OH})_2$ .

## SOLUBILITY IN WATER.

1 liter of aqueous solution contains 0.0026 gm.  $\text{Cd}(\text{OH})_2$  at  $25^\circ$ .

(Bodländer — Z. physik. Chem. 27, 66, '98.)

**CADMIUM IODIDE**  $\text{CdI}_2$ .

## SOLUBILITY IN WATER.

(Diets — W. Abh. p. t. Reichanstalt 3, 433, '00; see also Kremers — Pogg. Ann. 103, 57, '58; Eder — Dingl. polyt. J. 221, 189, '76; Etard — Ann. chim. phys. [7] 2, 536, '94.)

$t^\circ$ .	Gms. $\text{CdI}_2$ per 100 Gms.		Mols. $\text{CdI}_2$ per 100 Mols. $\text{H}_2\text{O}$ .	$t^\circ$ .	Gms. $\text{CdI}_2$ per 100 Gms.		Mols. $\text{CdI}_2$ per 100 Mols. $\text{H}_2\text{O}$ .
	Solution.	Water.			Solution.	Water.	
0	44.4	79.8	3.9	30	47.3	89.7	4.43
10	45.4	83.2	4.1	40	48.4	93.8	4.6
15	45.8	84.5	4.17	50	49.35	97.4	4.8
18	46.02	85.2	4.2	75	52.65	111.2	5.4
20	46.3	86.2	4.26	100	56.08	127.6	6.3
25	46.8	87.9	4.34				

Density of saturated solution at  $18^\circ = 1.590$ .

## SOLUBILITY OF CADMIUM IODIDE IN ORGANIC SOLVENTS.

Solvent.	$t^\circ$ .	Gms. $\text{CdI}_2$ per 100 Gms.		Observer.
		Solution.	Solvent.	
Absolute Alcohol	15	50.5	102.0	(Eder.)
Ethyl Alcohol	20	42.6	74.27	(Timofeiew — Compt. rend. 112, 1224, '91.)
Methyl Alcohol	20	59.0	143.7	(Timofeiew — Compt. rend. 112, 1224, '91.)
Propyl Alcohol	20	28.9	40.67	(Timofeiew — Compt. rend. 112, 1224, '91.)
Absolute Ether	15	21.7	27.7	(Eder.)
Absolute Acetone	18	20.0	25.0	(Naumann — Ber. 37, 4332, '04.)

**CADMIUM AMMONIUM IODIDES** (Mono and Di).

## SOLUBILITY IN WATER, ETC.

(Rimbach — Ber. 38, 1557, '05; at  $15^\circ$  Eder — Dingl. polyt. J. 221, 189, '76.)

Solvent.	Cd. Mono Ammonium Iodide.			Cd. Di Ammonium Iodide.		
	t°.	Gms. CdI <sub>2</sub> .NH <sub>4</sub> I per 100 Gms.		t°.	Gms. CdI <sub>2</sub> .2NH <sub>4</sub> I per 100 Gms.	
		Solution.	Solvent.		Solution.	Solvent.
Water	15	52.6	111.0	14.5	85.97	611.6
Abs. Alcohol	15	53	113	15	59	143
Abs. Ether	15	29.4	41.7	15	10	11

# **CADMIUM IODIDES**

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**CADMIUM POTASSIUM IODIDES**, Mono =  $\text{CdI}_2 \cdot \text{KI} \cdot \text{H}_2\text{O}$ ,  
Di =  $\text{CdI}_2 \cdot 2\text{KI} \cdot \text{H}_2\text{O}$ .

**CADMIUM Di SODIUM IODIDE**  $\text{CdI}_2 \cdot 2\text{NaI} \cdot 6\text{H}_2\text{O}$ .

SOLUBILITY IN WATER, ETC., AT 15°.

(Eder.)

Solvent.	Gms. $\text{CdI}_2 \cdot \text{KI}$ per 100 Gms.		Gms. $\text{CdI}_2 \cdot 2\text{KI}$ per 100 Gms.		Gms. $\text{CdI}_2 \cdot 2\text{NaI}$ per 100 Gms.	
	Solution.	Solvent.	Solution.	Solvent.	Solution.	Solvent.
Water	51.5	106	57.8	137	61.3	158.8
Abs. Alcohol	...	...	41.7	71	53.7	116.2
Abs. Ether	...	...	3.9	4.1	9.0	9.9

# **CADMIUM NITRATE** $\text{Cd}(\text{NO}_3)_2$ .

SOLUBILITY IN WATER.

(Funk — Wiss. Abh. p. 1. Reichenstalt 3 440, '00.)

t°.	Gms. $\text{Cd}(\text{NO}_3)_2$ per 100 Gms.		Mols. $\text{Cd}(\text{NO}_3)_2$ per 100 Mols. $\text{H}_2\text{O}$ .	Solid Phase.
	Solution.	Water.		
-13	37.37	59.67	4.55	$\text{Cd}(\text{NO}_3)_2 \cdot 9\text{H}_2\text{O}$
-1	47.33	89.86	6.85	"
+1	52.73	111.5	8.50	"
0	52.37	109.7	8.37	$\text{Cd}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$
+18	55.9	126.8	9.61	"
30	58.4	140.4	10.7	"
40	61.42	159.2	12.1	"
59.5	76.54	326.3	25.0	"

Density of saturated solution at 18° = 1.776.

# **CADMIUM OXALATE** $\text{CdC}_2\text{O}_4 \cdot 3\text{H}_2\text{O}$ .

1 liter of sat. aqueous solution contains 0.033 gm.  $\text{CdC}_2\text{O}_4$  at 18°.

(Kohlrausch — Z. physik. Chem. 44, 197, '03.)

# **CADMIUM SULPHATE** $\text{CdSO}_4$ .

SOLUBILITY IN WATER.

(Mylius and Funk — W. Abh. p. 1. Reichenstalt 3, 444, '00; see also Kohnstamm and Cohn — Wied Ann. 65, 344, '98; Steinwehr — Ann. der Phys. (Drude) [4] 9, 1050, '02; Etard — Ann. chim. phys [7] 2 536, '94.)

t°.	Gms. $\text{CdSO}_4$ per 100 Gms.		Solid Phase.	t°.	Gms. $\text{CdSO}_4$ per 100 Gms.		Solid Phase.
	Solution.	Water.			Solution.	Water.	
-17	44.5	80.2	$\text{CdSO}_4 \cdot 7\text{H}_2\text{O}$	40	43.99	78.54	$\text{CdSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$
-10	46.1	85.5	"	60	44.99	83.68	"
-5	48.5	94.2	"	73.5	46.6	87.28	"
-18	43.35	76.52	$\text{CdSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$	74.5	46.7	87.62	$\text{CdSO}_4 \cdot \text{H}_2\text{O}$
-10	43.27	76.28	"	77	42.2	73.02	"
0	43.01	76.48	"	85	39.6	65.57	"
+10	43.18	76.00	"	90	38.7	63.13	"
20	43.37	76.60	"	100	37.8	60.77	"

**SOLUBILITY OF CADMIUM SULPHATE IN AQUEOUS SOLUTIONS OF SULPHURIC ACID AT 0°.**

(Engel—Compt. rend. 104, 507, '87.)

Equivalents per 10 Gms. H <sub>2</sub> O.		Density of Solutions.	Grams per 100 Grams H <sub>2</sub> O.	
H <sub>2</sub> SO <sub>4</sub> .	CdSO <sub>4</sub> .		H <sub>2</sub> SO <sub>4</sub> .	CdSO <sub>4</sub> .
0.	71.6	1.609	0.00	74.61
3.87	70.9	1.591	1.90	73.87
12.6	62.4	1.545	6.18	65.03
28.1	50.6	1.476	13.78	52.73
43.3	40.8	1.435	21.23	42.52
47.6	37.0	1.421	23.34	38.56
53.8	32.7	1.407	26.38	34.07
71.5	23.0	1.379	35.06	23.96

**SOLUBILITY OF MIXED CRYSTALS OF CADMIUM SULPHATE AND FERROUS SULPHATE IN WATER AT 25°.**

(Stortenbecker — Z. physik. Chem. 34, 109, '00.)

Composition of Solution.					Mol. per cent Cd in Crystals of Solid Phase.
Gms. per 100 Gms. H <sub>2</sub> O.		Mols. per 100 Mols. H <sub>2</sub> O.		Mol. % Cd. in Sol.	
CdSO <sub>4</sub> .	FeSO <sub>4</sub> .	Cd.	Fe.		
Crystals with 2½ Mols. H <sub>2</sub> O.					
76.02	0.0	6.57	0.0	100	100
57.61	10.63	4.98	1.26	79.8	99.0
Crystals with 7 Mols. H <sub>2</sub> O.					
57.61	10.63	4.98	1.26	79.8	36.6
...	...	...	...	78.5	34.6
...	...	...	...	44.6	11.1
...	...	...	...	24.4	4.8
0.0	26.69	0.0	3.165	0.0	0.0

**CADMIUM POTASSIUM SULPHATE CdK<sub>2</sub>(SO<sub>4</sub>)<sub>2</sub>.**

**SOLUBILITY IN WATER.**

(Wyrouboff — Bull. soc. chim. [3] 25, 121, '01.)

t°.	G. CdK <sub>2</sub> (SO <sub>4</sub> ) <sub>2</sub> per 100 Gms. H <sub>2</sub> O.	Solid Phase.	t°.	G. CdK <sub>2</sub> (SO <sub>4</sub> ) <sub>2</sub> per 100 Gms. H <sub>2</sub> O.	Solid Phase.
16	42.89	CdK <sub>2</sub> (SO <sub>4</sub> ) <sub>2</sub> ·2H <sub>2</sub> O	26	42.50	CdK <sub>2</sub> (SO <sub>4</sub> ) <sub>2</sub> ·1½H <sub>2</sub> O
31	46.82	"	31	42.80	"
40	47.40	"	40	43.45	"
			64	44.90	"

# **CADMIUM SODIUM SULPHATE**

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## **CADMIUM SODIUM SULPHATE** $\text{CdNa}_2(\text{SO}_4)_2 \cdot 2\text{H}_2\text{O}$ .

SOLUBILITY IN WATER, ALSO WITH THE ADDITION OF CADMIUM SULPHATE AND OF SODIUM SULPHATE.

(Koppel, Gumpert — Z. physik. Chem. 52, 413, '05.)

t°.	Gms. per 100 Gms. Solution.		Gms. per 100 Gms. H <sub>2</sub> O.		Mols. per 100 Mols. H <sub>2</sub> O.		Solid Phase.
	CdSO <sub>4</sub> .	Na <sub>2</sub> SO <sub>4</sub> .	CdSO <sub>4</sub> .	Na <sub>2</sub> SO <sub>4</sub> .	CdSO <sub>4</sub> .	Na <sub>2</sub> SO <sub>4</sub> .	
24	22.25	15.07	35.49	24.04	3.07	3.05	$\text{CdNa}_2(\text{SO}_4)_2 \cdot 2\text{H}_2\text{O}$
30	22.55	15.29	36.28	24.60	3.14	3.12	
40	22.89	15.65	37.24	25.45	3.22	3.28	
0	40.32	4.85	73.54	8.85	6.36	1.12	$\text{CdNa}_2(\text{SO}_4)_2 \cdot 2\text{H}_2\text{O}$ + $\text{CdSO}_4 \cdot \frac{3}{2}\text{H}_2\text{O}$
10	39.91	5.24	72.77	9.55	6.30	1.21	
20	40.26	5.16	73.81	9.45	6.39	1.20	
40	39.89	7.18	75.38	13.56	6.52	1.72	$\text{CdNa}_2(\text{SO}_4)_2 \cdot 2\text{H}_2\text{O}$ + $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$
-14.8	40.18	4.60	72.68	8.32	6.29	1.05	
0	37.30	6.53	66.32	11.62	5.74	1.47	
10	32.53	8.69	55.34	14.78	4.79	1.84	$\text{CdNa}_2(\text{SO}_4)_2 \cdot 2\text{H}_2\text{O}$ + $\text{Na}_2\text{SO}_4$
20	22.69	14.71	36.25	23.52	3.14	2.98	
25	16.33	19.82	25.60	31.06	2.21	3.94	
30	9.21	27.80	14.62	44.14	1.26	4.59	$\text{CdNa}_2(\text{SO}_4)_2 \cdot 2\text{H}_2\text{O}$ + $\text{Na}_2\text{SO}_4$
35	8.26	29.35	13.26	47.06	1.15	5.96	
40	9.98	28.27	16.24	46.27	1.41	5.86	

## **CAESIUM ALUMS**

SOLUBILITY OF CAESIUM CHROMIUM ALUM, CAESIUM IRON ALUM, CAESIUM INDIUM ALUM, AND OF CAESIUM VANADIUM ALUM IN WATER.

(Locke — Am. Ch. J. 27, 174, '01.)

Formula of Alum.	t°.	Gms. per 100 cc. H <sub>2</sub> O.		Gram Mols. Salt per 100 cc. H <sub>2</sub> O.
		Anhydrous Salt.	Hydrated Salt.	
$\text{Cs}_2\text{Cr}_2(\text{SO}_4)_4 \cdot 24\text{H}_2\text{O}$	25	0.57	0.94	0.00151
"	30	0.96	1.52	0.0025
"	35	1.206	1.91	0.0032
"	40	1.53	2.43	0.00405
$\text{Cs}_2\text{Fe}_2(\text{SO}_4)_4 \cdot 24\text{H}_2\text{O}$	25	1.71	2.72	0.0045
"	30	2.52	4.01	0.0066
"	35	3.75	6.01	0.0099
"	40	6.04	9.80	0.0156
$\text{Cs}_2\text{In}_2(\text{SO}_4)_4 \cdot 24\text{H}_2\text{O}$	25	7.57	11.73	0.0172
$\text{Cs}_2\text{V}_2(\text{SO}_4)_4 \cdot 24\text{H}_2\text{O}$	25	0.771	1.31	0.00204

## 81 CAESIUM CHLORAUATE

CAESIUM CHLORAUATE  $\text{CsAuCl}_4$ .

## SOLUBILITY IN WATER.

(Rosenblatt — Ber. 19, 2537, '86.)

t°.	Gms. $\text{CsAuCl}_4$ per 100 Gms. Solution.	t°.	Gms. $\text{CsAuCl}_4$ per 100 Gms. Solution.	t°.	Gms. $\text{CsAuCl}_4$ per 100 Gms. Solution.
10	0.5	40	3.2	80	16.3
20	0.8	50	5.4	90	21.7
30	1.7	60	8.2	100	27.5
		70	12.0		

CAESIUM FLUOBORIDE  $\text{CsBF}_4$ .

100 grams water dissolve 0.92 gram  $\text{CsBF}_4$  at 20°, and 0.04 gram at 100°.

(Godeffroy — Ber. 9, 1367, '76.)

CAESIUM MERCURIO BROMIDE  $\text{CsBr} \cdot 2\text{HgBr}_2$ .

100 grams saturated aqueous solution contain 0.807 gram  $\text{CsBr} \cdot 2\text{HgBr}_2$  at 16°.

(Wells — Am. J. Sci. [3] 44, 221, '92.)

CAESIUM CARBONATE  $\text{Cs}_2\text{CO}_3$ .

100 grams absolute alcohol dissolve 11.1 grams  $\text{Cs}_2\text{CO}_3$  at 19°, and 20.1 grams at b. pt.

(Bunsen.)

CAESIUM CHLORIDE  $\text{CsCl}$ .

## SOLUBILITY IN WATER.

(Berkeley — Trans. Roy. Soc. (Lond.) 203 A, 208, '04; see also Hinrichsen and Sachs — Z. physik. Chem. 50, 99, '04-'05; at 25°, Foote.)

t°.	G. $\text{CsCl}$ per 100 Gms. Solution. Water.		G. Mol. $\text{CsCl}$ per Liter.	t°.	G. $\text{CsCl}$ per 100 Gms. Solution. Water.		G. Mol. $\text{CsCl}$ per Liter.
0	61.7	161.4	6.74	60	69.7	229.7	8.28
10	63.6	174.7	7.11	70	70.6	239.5	8.46
20	65.1	186.5	7.38	80	71.4	250.0	8.64
30	66.4	197.3	7.63	90	72.2	260.1	8.80
40	67.5	208.0	7.86	100	73.0	270.5	8.96
50	68.6	218.5	8.07	119.4	74.4	290.0	9.22

## SOLUBILITY OF MIXTURES OF CAESIUM CHLORIDE AND MERCURIC CHLORIDE IN WATER AT 25°.

(Foote — Am. Ch. J. 30, 340, '03.)

Gms. per 100 Gms. Solution.		Solid Phase.	Gms. per 100 Gms. Solution.		Solid Phase.
$\text{CaCl}_2$ .	$\text{HgCl}_2$ .		$\text{CaCl}_2$ .	$\text{HgCl}_2$ .	
65.61	0.0	$\text{CaCl}$	38.63	1.32	Double Salt $\text{CaHgCl}_3 = 38.3\% \text{ CaCl}$
65.78	0.215	$\text{CaCl} + \text{Ca}_2\text{HgCl}_3$	17.03	0.51	
62.36	0.32	Double Salt $\text{Ca}_2\text{HgCl}_3$ $= 65.1\% \text{ CaCl}$	1.53	0.42	
57.01	0.64		0.61	2.64	$\text{CaHg} + \text{Ca}_2\text{Hg}_2\text{Cl}_3$
52.35	1.23		0.49	2.91	Double Salt
51.08	1.44	$\text{Ca}_2\text{HgCl}_3 + \text{Ca}_2\text{HgCl}_4$	0.40	3.78	$\text{CaHg}_2\text{Cl}_3 = 23.7\% \text{ CaCl}$
49.30	1.49	Double Salt $\text{Ca}_2\text{HgCl}_3 = 55.4\% \text{ CaCl}$	0.44	4.63	$\text{CaHg}_2\text{Cl}_3 + \text{CaHg}_2\text{Cl}_{11}$
45.95	1.69		0.41	4.68	Double Salt
45.23	1.73	$\text{Ca}_2\text{HgCl}_3 + \text{CaHgCl}_3$	0.25	5.65	$\text{CaHg}_2\text{Cl}_{11} = 11.1\% \text{ CaCl}$
			0.18	7.09	$\text{CaHg}_2\text{Cl}_{11} + \text{HgCl}_2$
			0.0	6.90	$\text{HgCl}_2$

**CAESIUM CHLOROTELLURATE 82****CAESIUM CHLOROTELLURATE  $\text{CsTeCl}_6$ .****SOLUBILITY IN AQUEOUS HYDROCHLORIC ACID.**

(Wheeler — Am. J. Sci. [3] 45, 267, '93.)

100 parts HCl (Sp. Gr. 1.2) dissolve 0.05 part  $\text{CsTeCl}_6$  at 22°.100 parts HCl (Sp. Gr. 1.05) dissolve 0.78 part  $\text{CsTeCl}_6$  at 22°.**CAESIUM THALLIO CHLORIDE  $3\text{CsCl} \cdot \text{TlCl}_3 \cdot 2\text{H}_2\text{O}$ .**100 parts  $\text{H}_2\text{O}$  dissolve 2.76 parts  $3\text{CsCl} \cdot \text{TlCl}_3 \cdot 2\text{H}_2\text{O}$  at 17°, and 33.3 parts at 100°.

(Godeffroy — Z. Österr. Apoth. Ver. No. 9, 1886.)

**CAESIUM IODATE  $\text{CsIO}_3$ .**100 parts  $\text{H}_2\text{O}$  dissolve 2.6 parts  $\text{CsIO}_3$  at 24°, and 2.5 parts  $2\text{CsIO}_3 \cdot \text{I}_2\text{O}_5$  at 21°.

(Wheeler — Am. J. Sci. [3] 44, 123, '92.)

**CAESIUM IODIDE  $\text{CsI}$ .****SOLUBILITY OF MIXTURES OF CAESIUM IODIDE AND IODINE IN WATER.**

(Foote — Am. Ch. J. 29, 210, '03.)

t°.	Gms. per 100 Gms. Solution.		t°.	Gms. per 100 Gms. Solution.		Solid Phase at both Temps.
	CsI.	I.		CsI.	I.	
-4	27.68	0.0	35.6	51.48	0.0	CsI
-4	27.52	0.09	35.6	51.66	0.71	CsI and $\text{CsI}_3$
-4	3.18	0.31	35.6	10.72	1.78	$\text{CsI}_3$ and $\text{CsI}_5$
-0.2	0.85	0.34	35.6	3.74	1.60	$\text{CsI}_5$ and I

t°.	Gms. per 100 Gms. Solution.		In Separated Heavy Solution Gms. per 100 Gms. Solution.		Solid Phase.
	CsI.	I.	CsI.	I.	
52.2	16.75	4.52	...	...	$\text{CsI}_3$ and $\text{CsI}_5$
52.2	6.69	3.36	...	...	$\text{CsI}_5$ and I
52.2	6.72	3.32	22.94	73.72	$\text{CsI}_5$
52.2	6.65	3.45	22.80	74.63	I
73	26.98	15.07	...	...	$\text{CsI}_3$ and $\text{CsI}_5$
73	16.66	10.50	27.56	68.40	$\text{CsI}_5$
73	6.27	4.08	17.68	80.02	I

**CAESIUM (Tri) IODIDE  $\text{CsI}_3$ .**100 cc. saturated aqueous caesium iodide (about 17 per cent CsI) solution contain 0.97 gram  $\text{CsI}_3$  at 20°, density of solution = 1.154.

(Wells — Am. J. Sci. [3] 44, 221, '92.)

**CAESIUM NITRATE  $\text{CsNO}_3$ .****SOLUBILITY IN WATER.**

(Berkeley — Trans. Roy. Soc. (Lond) 203 A, 213, '04.)

t°.	Gms. $\text{CsNO}_3$ per 100 Gms. Solution.		G. Mols. $\text{CsNO}_3$ per Liter.	t°.	Gms. $\text{CsNO}_3$ per 100 Gms. Solution.		G. Mols. $\text{CsNO}_3$ per Liter.
	Solution.	Water.			Solution.	Water.	
0	8.54	9.33	0.476	60	45.6	83.8	3.41
10	12.97	14.9	0.725	70	51.7	107.0	4.10
20	18.7	23.0	1.11	80	57.3	134.0	4.81
30	25.3	33.9	1.58	90	62.0	163.0	5.50
40	32.1	47.2	2.12	100	66.3	197.0	6.19
50	39.3	64.4	2.73	106.2	68.8	220.3	6.58

**CAESIUM OXALATE**  $\text{Cs}_2\text{C}_2\text{O}_4 \cdot \text{H}_2\text{O}$ .**SOLUBILITY OF MIXTURES OF CAESIUM OXALATE AND OXALIC ACID IN WATER AT 25°.**

(Foote and Andrew — Am. Ch. J. 34 156, '05.)

Varying amounts of the two substances were dissolved in hot water and the solutions allowed to cool in a thermostadt held at 25°.

Gms. per 100 Gms. Solution.		G. Mols. per 100 G. Mols. $\text{H}_2\text{O}$ .		Solid Phase.
$\text{H}_2\text{C}_2\text{O}_4$ .	$\text{Cs}_2\text{C}_2\text{O}_4$ .	$\text{H}_2\text{C}_2\text{O}_4$ .	$\text{Cs}_2\text{C}_2\text{O}_4$ .	
10.20	...	2.274	...	$\text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$
10.29	0.61	2.314	0.035	$\text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O} + \text{H}_3\text{Cs}(\text{C}_2\text{O}_4)_2 \cdot 2\text{H}_2\text{O}$
7.90	9.92	1.924	0.614	Double Salt.
4.11	25.12	1.162	1.81	$\text{H}_2\text{Cs}(\text{C}_2\text{O}_4)_2 \cdot 2\text{H}_2\text{O}$
4.32	27.55	1.279	2.06	
4.27	28.30	1.267	2.14	Double Salt.
4.40	35.90	1.476	3.07	$\text{H}_4\text{Cs}_2(\text{C}_2\text{O}_4)_3$
4.82	40.10	1.752	3.71	
4.45	42.32	1.672	4.05	Double Salt.
3.05	48.80	1.268	5.16	
1.04	68.69	0.688	11.56	$\text{HCsC}_2\text{O}_4$
0.91	71.24	0.648	13.06	$\text{HCsC}_2\text{O}_4 + \text{H}_6\text{Cs}_3(\text{C}_2\text{O}_4)_7$
0.77	73.45	0.598	14.51	Double Salt.
0.75	74.04	0.596	14.96	
0.74	75.20	0.625	15.93	$\text{H}_6\text{Cs}_3(\text{C}_2\text{O}_4)_7 + \text{Cs}_2\text{C}_2\text{O}_4 \cdot \text{H}_2\text{O}$
0.0	75.82	0.0	15.97	$\text{Cs}_2\text{C}_2\text{O}_4 \cdot \text{H}_2\text{O}$

**CAESIUM PERMANGANATE**  $\text{CsMnO}_4$ .

100 cc. sat. aqueous solution contain 0.097 gm.  $\text{CsMnO}_4$  at 1°, 0.23 gm. at 19°, and 1.25 gms. at 59°. (Patterson — J. Am. Chem. Soc. 28, 1735, '06.)

**CAESIUM SELENATE**  $\text{Cs}_2\text{SeO}_4$ .

100 grams  $\text{H}_2\text{O}$  dissolve 245 grams  $\text{Cs}_2\text{SeO}_4$  at 12°. (Tutton — J. Chem. Soc. 71, 850, '97.)

**CAESIUM SULPHATE**  $\text{Cs}_2\text{SO}_4$ .**SOLUBILITY IN WATER.**

(Berkeley — Trans. Roy. Soc. (Lond.) 203 A, 210, '04.)

t°.	Gms. $\text{Cs}_2\text{SO}_4$ per 100 Gms.		G. Mols. $\text{Cs}_2\text{SO}_4$ per Liter.	t°.	Gms. $\text{Cs}_2\text{SO}_4$ per 100 Gms.		G. Mols. $\text{Cs}_2\text{SO}_4$ per Liter.
	Solution.	Water.			Solution.	Water.	
0	62.6	167.1	3.42	60	66.7	199.9	3.78
10	63.4	173.1	3.49	70	67.2	205.0	3.83
20	64.1	178.7	3.56	80	67.8	210.3	3.88
30	64.8	184.1	3.62	90	68.3	214.9	3.92
40	65.5	189.9	3.68	100	68.8	220.3	3.97
50	66.1	194.9	3.73	108.6	69.2	224.5	4.00



# CAESIUM DOUBLE SULPHATES

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## SOLUBILITY OF CAESIUM DOUBLE SULPHATES IN WATER AT 25°.

(Locke — Am. Ch. J. 27, 459, '01.)

Name.	Formula.	Gms. Anhydrous Salt per 100 Gms.		Gm. Mols. Salt per 100 Gms. H <sub>2</sub> O.
		Solution.	Water.	
Caesium Cadmium Sulphate	C <sub>2</sub> Cd(SO <sub>4</sub> ) <sub>2</sub> .6H <sub>2</sub> O	58.16	139.9	0.2455
Caesium Cobalt Sulphate	C <sub>2</sub> Co(SO <sub>4</sub> ) <sub>2</sub> .6H <sub>2</sub> O	29.52	41.9	0.081
Caesium Copper Sulphate	C <sub>2</sub> Cu(SO <sub>4</sub> ) <sub>2</sub> .6H <sub>2</sub> O	31.49	46.0	0.0882
Caesium Iron Sulphate	C <sub>2</sub> Fe(SO <sub>4</sub> ) <sub>2</sub> .6H <sub>2</sub> O	50.29	101.1	0.1967
Caesium Magnesium Sulphate	C <sub>2</sub> Mg(SO <sub>4</sub> ) <sub>2</sub> .6H <sub>2</sub> O	34.77	53.3	0.1106
Caesium Manganese Sulphate	C <sub>2</sub> Mn(SO <sub>4</sub> ) <sub>2</sub> .6H <sub>2</sub> O	44.58	80.4	0.157
Caesium Nickel Sulphate	C <sub>2</sub> Ni(SO <sub>4</sub> ) <sub>2</sub> .6H <sub>2</sub> O	20.37	25.6	0.0495
Caesium Zinc Sulphate	C <sub>2</sub> Zn(SO <sub>4</sub> ) <sub>2</sub> .6H <sub>2</sub> O	27.87	38.6	0.0738

# CAFFEINE C<sub>8</sub>H(CH<sub>3</sub>)<sub>3</sub>N<sub>4</sub>O<sub>2</sub>.H<sub>2</sub>O.

## SOLUBILITY IN SEVERAL SOLVENTS.

(U. S. P.; Göckel — J. Chem. Soc. 74, 327, '98; Commaile — Compt. rend. 81, 819, '75.)

Solvent.	Grams Caffeine per 100 Grams Solvent at:					
	25°.	80°.	18°.	b. pt.	15.17°.	b. pt.
	U. S. P.		Göckel.		Commaile.	
Water	2.19	19.23	...	...	1.31†	45.51†
Alcohol	1.88	5.85*	...	...	0.61†	3.12†
Ether	0.267	...	0.119	0.295	0.044†	0.36†
Chloroform	12.5	...	11.77	15.63	12.97†	19.02†
Benzene	...	...	0.911	5.29	...	...
Carbon Tetra						
Chloride	...	...	0.089	0.702	...	...
Carbon Bisulphide	...	...	...	...	0.0585†	0.454†

\* 60°. † 65°. ‡ Gms. anhydrous caffeine. § Abs. alcohol and abs. ether.

# CALCIUM ACETATE Ca(CH<sub>3</sub>COO)<sub>2</sub>.2H<sub>2</sub>O.

## SOLUBILITY IN WATER.

(Lumsden — J. Chem. Soc. 81, 355, '02; Krasnicki — Monatsh. Chem. 8, 597, '87.)

t°.	Gms. Ca(CH <sub>3</sub> COO) <sub>2</sub> per 100 Gms.		Solid Phase.	t°.	Gms. Ca(CH <sub>3</sub> COO) <sub>2</sub> per 100 Gms.		Solid Phase.
	Solution.	Water.			Solution.	Water.	
0	27.2	37.4	Ca(CH <sub>3</sub> COO) <sub>2</sub> .2H <sub>2</sub> O	60	24.6	32.7	Ca(CH <sub>3</sub> COO) <sub>2</sub> .2H <sub>2</sub> O
10	26.5	36.0	Ca(CH <sub>3</sub> COO) <sub>2</sub> .2H <sub>2</sub> O	80	25.1	33.5	Ca(CH <sub>3</sub> COO) <sub>2</sub> .2H <sub>2</sub> O
20	25.8	34.7	Ca(CH <sub>3</sub> COO) <sub>2</sub> .2H <sub>2</sub> O	84	25.3	33.8	Ca(CH <sub>3</sub> COO) <sub>2</sub> .2H <sub>2</sub> O
25	25.5	34.2	Ca(CH <sub>3</sub> COO) <sub>2</sub> .2H <sub>2</sub> O	85	24.7	32.9	Ca(CH <sub>3</sub> COO) <sub>2</sub> .H <sub>2</sub> O
30	25.3	33.8	Ca(CH <sub>3</sub> COO) <sub>2</sub> .2H <sub>2</sub> O	90	23.7	31.1	Ca(CH <sub>3</sub> COO) <sub>2</sub> .H <sub>2</sub> O
40	24.9	33.2	Ca(CH <sub>3</sub> COO) <sub>2</sub> .2H <sub>2</sub> O	100	22.9	29.7	Ca(CH <sub>3</sub> COO) <sub>2</sub> .H <sub>2</sub> O

## SOLUBILITY OF CALCIUM ACETATE IN AN AQUEOUS SATURATED SOLUTION OF SUGAR AT 31.25°.

(Köhler — Z. Ver. Zuckerind. 47, 447, '97.)

100 gms. solution contain 8.29 gms. Ca(CH<sub>3</sub>COO)<sub>2</sub> + 60.12 gms. sugar.  
100 gms. water dissolve 26.3 gms. Ca(CH<sub>3</sub>COO)<sub>2</sub> + 190.3 gms. sugar.

**CALCIUM** (Tri) Methyl **ACETATE**  $\text{Ca}[(\text{CH}_3)_2\text{CCOO}]_2$ .

**CALCIUM** (Di) Ethyl **ACETATE**  $\text{Ca}[(\text{C}_2\text{H}_5)_2\text{CHCOO}]_2$ .

**CALCIUM** Methyl Ethyl **ACETATE**  $\text{Ca}[\text{CH}_3(\text{C}_2\text{H}_5)_2\text{CHCOO}]_2$ .

SOLUBILITY OF EACH IN WATER.

(Landau — Monatsch. Chem. 14, 717, '93; Keppish — *Ibid.* 9, 600, '88; Sedlitzki — *Ibid.* 8, 573, '87.)

Ca. Tri Methyl Acetate. Ca. Di Ethyl Acetate. Ca. Methyl Ethyl

t°.	Gms. $\text{Ca}(\text{C}_2\text{H}_5\text{O}_2)_2$ per 100 Gms.		Gms. $\text{Ca}(\text{C}_2\text{H}_5\text{O}_2)_2$ per 100 Gms.		Gms. $\text{Ca}(\text{C}_2\text{H}_5\text{O}_2)_2$ per 100 Gms.	
	Water.	Solution.	Water.	Solution.	Water.	Solution.
0	7.30	6.81	30.3	23.22	28.78	22.35
10	6.84	6.40	27.8	21.75	31.71	24.07
20	6.54	6.14	25.6	20.38	33.76	25.23
30	6.40	6.01	23.7	19.16	34.92	25.89
40	6.44	6.05	22.1	18.10	35.20	26.04
50	6.64	6.22	20.8	17.22	34.60	25.71
60	6.86	6.42	19.9	16.60	33.11	24.89
70	7.11	6.64	19.2	16.11	30.74	23.41
80	7.38	6.87	...	...	27.49	21.56

**CALCIUM** Methyl Propyl **ACETATE**  $\text{Ca}[\text{CH}_3(\text{C}_2\text{H}_5)_2\text{CHCOO}]_2$ .

**CALCIUM** (Di) Propyl **ACETATE**  $\text{Ca}[(\text{C}_2\text{H}_5)_2\text{CHCOO}]_2$ .

**CALCIUM** (Iso) Butyl **ACETATE**  $\text{Ca}[(\text{CH}_3)_2\text{CH}(\text{CH}_2)_2\text{COO}]_2$ .

SOLUBILITY OF EACH IN WATER.

(Stiassny — Monatsch. Chem. 12, 596, '91; Furth — *Ibid.* 9, 313, '88; König — *Ibid.* 15, 22, '94.)

Ca. Methyl Propyl Acetate. Ca. Di Propyl Acetate. Ca. Iso Butyl

Acetate.

t°.	Gms. $\text{Ca}(\text{C}_2\text{H}_5\text{O}_2)_2$ per 100 Gms.		Gms. $\text{Ca}(\text{C}_2\text{H}_5\text{O}_2)_2$ per 100 Gms.		Gms. $\text{Ca}(\text{C}_2\text{H}_5\text{O}_2)_2$ per 100 Gms.	
	Water.	Solution.	Water.	Solution.	Water.	Solution.
0	16.58	14.22	9.57	8.73	7.48	6.96
10	15.80	13.65	8.35	7.71	6.38	5.99
20	15.14	13.15	7.19	6.71	5.66	5.36
30	14.61	12.75	6.11	5.77	5.31	5.04
40	14.21	12.45	5.09	4.84	5.31	5.04
50	13.94	12.24	4.14	3.98	5.68	5.37
60	13.79	12.13	3.25	3.15	6.41	6.02
70	13.78	12.12	2.44	2.38	7.51	6.98
80	13.89	12.20	1.65	1.62	8.97	8.23
90	...	...	...	...	10.79	9.74

**CALCIUM BROMIDE**  $\text{CaBr}_2$ .

SOLUBILITY IN WATER.

(Kremers — Pogg. Ann. 103, 65, '58; Etard — Ann. chim. phys. [7] 2, 532, '94, gives results which yield an irregular curve and are evidently less accurate than those of Kremers.)

t°.	Gms. $\text{CaBr}_2$ per 100 Gms.		t°.	Gms. $\text{CaBr}_2$ per 100 Gms.	
	Water.	Solution.		Water.	Solution.
-22	101	50.5	34.2	185	65
0	125	55.5	40	213	68.1
10	132	57.0	60	278	73.5
20	143	58.8	80	295	74.7
25	153	60.5	105	312	75.7

Density of saturated solution at 20° = 1.82.

**CALCIUM BUTYRATE**

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**CALCIUM** (Normal) **BUTYRATE**  $\text{Ca}[\text{CH}_3(\text{CH}_2)_3\text{COO}]_2 \cdot \text{H}_2\text{O}$ .**CALCIUM** (Iso) **BUTYRATE**  $\text{Ca}[(\text{CH}_3)_2\text{CH}.\text{COO}]_2 \cdot 5\text{H}_2\text{O}$ .**SOLUBILITY OF EACH IN WATER.**

(Lumsden — J. Chem. Soc. 81, 355, '02; see also Chancel and Parmentier — Compt. rend. 104, 474, '87; Deszathy — Monatsh. Chem. 14, 251, '93, and also Hecht — Liebig's Annalen 213, 72, '82, give results for the normal salt which are somewhat below those of Lumsden for the lower temperatures. Sedlitzki — Monatsh. Chem. 8, 566, '87, gives slightly different results for the iso salt.)

Calcium Normal Butyrate.			Calcium Iso Butyrate.			
t °.	Gms. $\text{Ca}(\text{C}_4\text{H}_7\text{O}_2)_2$ per 100 Gms.		t °.	Gms. $\text{Ca}(\text{C}_4\text{H}_7\text{O}_2)_2$ per 100 Gms.		Solid Phase.
	Water.	Solution.		Water.	Solution.	
0	20.31	16.89	0	20.10	16.78	$\text{Ca}(\text{C}_4\text{H}_7\text{O}_2)_2 \cdot 5\text{H}_2\text{O}$
10	19.15	16.08	20	22.40	18.30	"
20	18.20	15.39	30	23.80	19.23	"
25	17.72	15.05	40	25.28	20.65	"
30	17.25	14.71	60	28.40	22.12	"
40	16.40	14.09	62	28.70	22.30	"
60	15.15	13.16	65	28.25	22.03	$\text{Ca}(\text{C}_4\text{H}_7\text{O}_2)_2 \cdot \text{H}_2\text{O}$
80	14.95	13.01	80	27.00	21.26	"
100	15.85	13.69	100	26.10	20.69	"

**CALCIUM CAPROATE**  $\text{Ca}[\text{CH}_3(\text{CH}_2)_4\text{COO}]_2 \cdot \text{H}_2\text{O}$ .**CALCIUM** 3 Methyl **PENTANATE**  $\text{Ca}[\text{CH}_3\text{CH}_2\text{CH}(\text{CH}_3)\text{CH}_2\text{COO}]_2 \cdot 3\text{H}_2\text{O}$ .**CALCIUM CAPRYLATE**  $\text{Ca}[\text{CH}_3(\text{CH}_2)_6\text{COO}]_2 \cdot \text{H}_2\text{O}$ .**SOLUBILITY OF EACH IN WATER.**

(Lumsden; the Pentanate, Kulish — Monatsh. Chem. 14, 566, '93; see also Keppiah — *Ibid.* 9, 504, '88, and Altschul — *Ibid.* 17, 571, '96, for results on the Caproate.)

Ca. Caproate.		Ca. 3 Methyl Pentanate.		Ca. Caprylate.	
t°.	Gms. $\text{Ca}(\text{C}_6\text{H}_{11}\text{O}_2)_2$ per 100 Gms. $\text{H}_2\text{O}$ .	t°.	Gms. $\text{Ca}(\text{C}_6\text{H}_{11}\text{O}_2)_2$ per 100 Gms.	t°.	Gms. $\text{Ca}(\text{C}_8\text{H}_{17}\text{O}_2)_2$ per 100 Gms. $\text{H}_2\text{O}$ .
			Water. Solution.		
0	2.23	12	33 10.98	0	0.33
20	2.18	17	18 14.66	20	0.31
40	2.15	18	99 15.97	40	0.28
50	2.10	18	73 15.78	50	0.26
60	2.15	17	71 15.04	60	0.24
80	2.30	13	37 11.80	80	0.32
100	2.57	9	94 9.04	100	0.50

**CALCIUM CARBONATE**  $\text{CaCO}_3$ .**SOLUBILITY IN WATER, AS DETERMINED BY THE ELECTROLYTIC CONDUCTIVITY METHOD.**

(Holleman, Kohlrausch, and Rose — Z. physik. Chem. 12, 129, 241, '93.)

1 liter solution contains 0.01 gram  $\text{CaCO}_3$  at 8.7°, and 0.012 gram at 20°.

**CALCIUM BICARBONATE**  $\text{Ca}(\text{HCO}_3)_2$ .**SOLUBILITY IN WATER AT 15°.**

Calcium carbonate in presence of water, free from and containing carbon dioxide, dissolves as the hydrogen carbonate.

(Among the investigators who have reported results upon the solubility of calcium bicarbonate may be mentioned, Cossa — *Z. anal. Chem.* 8, 145, '69; Schloesing — *Compt. rend.* 74, 1522, '72; Caro — *Arch. Pharm.* [3] 4, 145, '74; Reid — *Proc. Roy. Soc. (Edin.)* 15, 151, '87-'88; Irving and Young — *J. Chem. Soc.* 56, 344, '88; Anderson — *Proc. Roy. Soc. (Edin.)* 16, 310, '88-'89; Engel — *Ann. chim. phys.* [6] 13, 345, '88; Lubavin — *J. russ. phys. chem. Ges.* 24, 389, '92; Pollacci — *L'Orosi* 19, 217, '96, etc. The results, however, which appear of most interest and reliability are the following by Treadwell and Reuter — *Z. anorg. Chem.* 67, 185, '96.)

cc. $\text{CO}_2$ per 100 cc. Gaseous Phase (0° and 760 mm.).	Partial Pressure of $\text{CO}_2$ in mm. Hg.	Gms. per 100 cc. Saturated Solution.		
		Free $\text{CO}_2$ .	$\text{Ca}(\text{HCO}_3)_2$ .	Ca.
8.94	67.9	0.1574	0.1872	0.0462
6.04	45.9	0.0863	0.1755	0.0433
5.45	41.4	0.0528	0.1597	0.0394
2.18	16.6	0.0485	0.1540	0.0380
1.89	14.4	0.0347	0.1492	0.0368
1.72	13.1	0.0243	0.1331	0.0329
0.79	6.0	0.0145	0.1249	0.0308
0.41	3.1	0.0047	0.0821	0.0203
0.25	1.9	0.0029	0.0595	0.0147
0.08	0.6	...	0.0402	0.0099
...	...	...	0.0385	0.0095

Therefore 1 liter sat. solution at 15° and 0 partial pressure of  $\text{CO}_2$  contains 0.385 gram  $\text{Ca}(\text{HCO}_3)_2$ .

**SOLUBILITY OF CALCIUM BICARBONATE IN AQUEOUS SODIUM CHLORIDE SOLUTION AT 15°.**

(Treadwell and Reuter.)

The  $\text{NaCl}$  solution contained about 5 grams per liter, and was therefore approximately  $\frac{1}{10}$  normal.

cc. $\text{CO}_2$ per 100 cc. Gaseous Phase (0° and 760 mm.).	Partial Pressure of $\text{CO}_2$ in mm. Hg.	Grams per 100 cc. Saturated Solution.		
		Free $\text{CO}_2$ .	$\text{Ca}(\text{HCO}_3)_2$ .	Ca.
16.95	128.8	0.1325	0.2184	0.0539
11.47	87.2	0.1101	0.2143	0.0529
6.07	46.1	0.0235	0.1492	0.0368
3.16	24.0	0.0135	0.1183	0.0292
0.50	3.8	0.0027	0.0739	0.0182
.41	3.4	0.0003	0.0490	0.0121
	...	...	0.0349	0.0086
	...	...	0.0332	0.0082

## CALCIUM BICARBONATE 88

### SOLUBILITY OF CALCIUM BICARBONATE IN AQUEOUS SOLUTIONS OF AMMONIUM NITRATE, SODIUM CHLORIDE AND OF SODIUM SULPHATE.

(Cameron and Seidell — J. Physic. Chem. 6, 50, '02; Berju and Kosminiko — Landw. Vers. Stat. 60, 422, '04.)

In $\text{NH}_4\text{NO}_3$ Solutions at 18°.		In NaCl Solutions at 25°.		In $\text{Na}_2\text{SO}_4$ Solutions at 24°.		
Grams per Liter Solution.		Grams per Liter Solution.		Grams per Liter Solution.		
$\text{NH}_4\text{NO}_3$ .	$\text{Ca}(\text{HCO}_3)_2$ .	NaCl.	$\text{Ca}(\text{HCO}_3)_2$ .	$\text{Na}_2\text{SO}_4$ .	$\text{Ca}(\text{HCO}_3)_2$ total.	$\text{Ca}(\text{HCO}_3)_2$ .
0	0.210	0	0.1046	0	0.092	0.092
5	0.340	5	0.150	5	0.175	0.175
10	0.415	10	0.180	10	0.232	0.220
20	0.547	20	0.210	20	0.277	0.262
40	0.744	40	0.225	40	0.332	0.307
80	0.940	80	0.220	80	0.400	0.347
		100	0.215	100	0.432	0.355
		150	0.192	150	0.510	0.382
		200	0.170	200	0.600	0.400
		250	0.137	250	0.725	0.435

### CALCIUM CHLORATE $\text{Ca}(\text{ClO}_3)_2 \cdot 2\text{H}_2\text{O}$ .

100 grams saturated aqueous solution contain 64.0 grams  $\text{Ca}(\text{ClO}_3)_2$  at 18°. Density of solution is 1.729.

(Mylius and Funk — Ber. 30, 1718, '97.)

### CALCIUM CHLORIDE $\text{CaCl}_2$ .

#### SOLUBILITY IN WATER.

(Roozeboom — Z. physik. Chem. 4, 42, '89; see also Mulder; Ditté — Compt. rend. 92, 242, '81; Eng' — Ann. chim. phys. (6) 13, 381, '88; Etard — *Ibid.* (7) 2, 532, '94.)

t°.	Gms. $\text{CaCl}_2$ per 100 Gms.		Solid Phase.	t°.	Gms. $\text{CaCl}_2$ per 100 Gms.		Solid Phase.
	Water.	Solution.			Water.	Solution.	
-55	42.5	29.8	Ice + $\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$	60	136.8	57.8	$\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$
-25	50.0	33.3	$\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$	70	141.7	58.6	$\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$
0	59.5	37.3	$\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$	80	147.0	59.5	$\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$
10	65.0	39.4	$\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$	90	152.7	60.6	$\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$
20	74.5	42.7	$\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$	100	159.0	61.4	$\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$
30.2	102.7	50.7	$\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$	120	173.0	63.4	$\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$
20	91.0	47.6	$\text{CaCl}_2 \cdot 4\text{H}_2\text{O} \alpha$	140	191.0	65.6	$\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$
29.8	100.6	50.1	$4\text{H}_2\text{O} \alpha + 6\text{H}_2\text{O}$	160	222.5	69.0	$\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$
40	115.3	53.4	$4\text{H}_2\text{O} \alpha$	170	255.0	71.8	$\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$
20	104.5	51.1	$\text{CaCl}_2 \cdot 4\text{H}_2\text{O} \beta$	175.5	297.0	74.8	$\text{CaCl}_2 \cdot 2\text{H}_2\text{O} + \text{CaCl}_2 \cdot 11\text{H}_2\text{O}$
29.2	112.8	53.0	$4\text{H}_2\text{O} \beta + 6\text{H}_2\text{O}$	180	300.0	75.0	$\text{CaCl}_2 \cdot \text{H}_2\text{O}$
35	122.5	55.0	$4\text{H}_2\text{O} \beta$	200	311.0	75.7	$\text{CaCl}_2 \cdot \text{H}_2\text{O}$
38.4	127.5	56.0	$4\text{H}_2\text{O} \beta + \text{CaCl}_2 \cdot 2\text{H}_2\text{O}$	235	332.0	76.8	$\text{CaCl}_2 \cdot \text{H}_2\text{O}$
45.3	130.2	56.6	$4\text{H}_2\text{O} \alpha + \text{CaCl}_2 \cdot 2\text{H}_2\text{O}$	260	347.0	77.6	$\text{CaCl}_2 \cdot \text{H}_2\text{O}$

Density of saturated solution at 0° = 1.367, at 15° = 1.399, at 18° = 1.417.

**SOLUBILITY OF CALCIUM CHLORIDE IN AQUEOUS SOLUTIONS OF  
HYDROCHLORIC ACID AT 0°.**

(Engel — Compt. rend. 104, 434, '87.)

G. Mols. in Mgs. per 10 cc. Solution.		Density of Solutions.	Grams per 100 cc. Solution.	
CaCl <sub>2</sub> .	HCl.		CaCl <sub>2</sub> .	HCl.
92.7	0.0	1.367	51.45	0.0
83.7	9.1	1.344	46.45	3.32
77.1	16.0	1.326	42.80	5.83
66.25	29.25	1.310	36.77	10.66
53.75	43.45	1.283	29.84	15.84
36.25	63.5	1.250	20.12	23.15
20.3	95.0	1.238	11.29	34.62

**SOLUBILITY OF MIXTURES OF CALCIUM CHLORIDE AND ALKALI  
CHLORIDES.**

(Mulder; Rüdorff.)

100 grams H<sub>2</sub>O dissolve 63.5 grams CaCl<sub>2</sub> + 4.9 grams KCl at 7° (M)  
 100 grams H<sub>2</sub>O dissolve 57.6 grams CaCl<sub>2</sub> + 2.4 grams NaCl at 4° (M)  
 100 grams H<sub>2</sub>O dissolve 59.5 grams CaCl<sub>2</sub> + 4.6 grams NaCl at 7° (M)  
 100 grams H<sub>2</sub>O dissolve 72.6 grams CaCl<sub>2</sub> + 16.0 grams NaCl at 15° (R)

**SOLUBILITY OF CALCIUM CHLORIDE IN AQUEOUS ALCOHOL AT ROOM  
TEMPERATURE.**

(Böttker — Z. physik. Chem. 22, 570, '97.)

Solution Used.	Vol. per cent Alcohol.	Gms. CaCl <sub>2</sub> per 5 cc. Sol.	Solution Used.	Vol. per cent Alcohol.	Gms. CaCl <sub>2</sub> per 5 cc. Sol.
15 Gms. CaCl <sub>2</sub> .6H <sub>2</sub> O + 20 cc. alcohol	92.3	1.430	15 Gms. CaCl <sub>2</sub> .6H <sub>2</sub> O + 20 cc.: alcohol + 2 Gms. CaCl <sub>2</sub>	99.3	1.561
15 Gms. CaCl <sub>2</sub> .6H <sub>2</sub> O + 20 cc. alcohol	97.3	1.409	" + 3 " "	"	1.590
15 Gms. CaCl <sub>2</sub> .6H <sub>2</sub> O + 20 cc. alcohol	99.3	1.429	" + 4 " "	"	1.641
15 Gms. CaCl <sub>2</sub> .6H <sub>2</sub> O + 1 Gm. CaCl <sub>2</sub>	99.3	1.529	" + 5 " "	"	1.709

**SOLUBILITY OF CALCIUM CHLORIDE IN A SATURATED SOLUTION OF  
SUGAR AT 31.25°.**

(Köhler — Z. Ver. Zuckerind. 47, 447, '97.)

100 grams saturated solution contain 42.84 grams sugar + 25.25  
 grams CaCl<sub>2</sub>, or 100 grams water dissolve 135.1 grams sugar + 79.9  
 grams CaCl<sub>2</sub>.

**CALCIUM CITRATE** Ca<sub>3</sub>(C<sub>6</sub>H<sub>5</sub>O<sub>7</sub>)<sub>2</sub>.4H<sub>2</sub>O.

**SOLUBILITY IN WATER AND IN ALCOHOL AT 18° AND AT 25°.**

(Partheil and Hübner — Archiv. Pharm. 241, 413, '03.)

Solvent.	Grams Ca <sub>3</sub> (C <sub>6</sub> H <sub>5</sub> O <sub>7</sub> ) <sub>2</sub> .4H <sub>2</sub> O per 100 Gms. Solvent at:	
	18°.	25°.
Water	0.08496	0.0959
Alcohol (Sp. Gr. 0.8092 = 95%)	0.0065	0.0089

# CALCIUM CHROMATE

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## CALCIUM CHROMATE $\text{CaCrO}_4$ .

### SOLUBILITY OF THE SEVERAL HYDRATES IN WATER.

(Mylius and Wrochem — Wiss. Abh. p. t. Reichanstalt 3, 462, '00.)

t°.	Gms. $\text{CaCrO}_4$ per 100 Gms.		Mols. $\text{CaCrO}_4$ per 100 Mols. $\text{H}_2\text{O}$ .	t°.	Gms. $\text{CaCrO}_4$ per 100 Gms.		Mols. $\text{CaCrO}_4$ per 100 Mols. $\text{H}_2\text{O}$ .
	Water.	Solution.			Water.	Solution.	
Solid Phase, $\alpha$ $\text{CaCrO}_4 \cdot 2\text{H}_2\text{O}$ . (Monoclinic.)							
0	17.3	14.75	2.0	0	7.3	6.8	0.84
18	16.68	14.3	1.93	18	4.8	4.4	0.51
20	16.6	14.22	1.93	31	3.84	3.7	0.44
30	16.5	13.89	1.85	38.5	2.67	2.6	0.31
45	14.3	12.53	1.65	50	1.63	1.6	0.19
Solid Phase, $\beta$ $\text{CaCrO}_4 \cdot 2\text{H}_2\text{O}$ (Rhombic.)							
0	10.9	9.8	1.25	60	1.13	1.1	0.13
18	11.5	10.3	1.33	100	0.81	0.8	0.09
40	11.6	10.4	1.34	Solid Phase, $\text{CaCrO}_4$ .			
Solid Phase, $\text{CaCrO}_4 \cdot \text{H}_2\text{O}$ .							
0	13.0	11.5	1.50	0	4.5	4.3	0.52
18	10.6	9.6	1.22	18	2.32	2.27	0.27
25	10.0	9.1	1.15	31	2.92	1.89	0.22
40	8.5	7.8	0.98	50	1.12	1.11	0.13
60	6.1	5.7	0.70	60	0.83	0.82	0.11
75	4.8	4.6	0.56	70	0.80	0.79	0.09
100	3.2	3.1	0.37	100	0.42	0.42	0.05

Densities of the saturated solutions of the above several hydrates at 18° are:  $\alpha$   $\text{CaCrO}_4 \cdot 2\text{H}_2\text{O}$ , 1.149;  $\beta$   $\text{CaCrO}_4 \cdot 2\text{H}_2\text{O}$ , 1.105;  $\text{CaCrO}_4 \cdot \text{H}_2\text{O}$ , 1.096;  $\text{CaCrO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$ , 1.044;  $\text{CaCrO}_4$ , 1.023.

100 cc. 20% alcohol dissolve 1.206 grams  $\text{CaCrO}_4$ .

100 cc. 53% alcohol dissolve 0.88 gram  $\text{CaCrO}_4$ .

(Fresenius — Z. anal. Chem. 30, 672, '91.)

## CALCIUM POTASSIUM FERROCYANIDE $\text{CaK}_2\text{Fe}(\text{CN})_6 \cdot 3\text{H}_2\text{O}$ .

100 parts  $\text{H}_2\text{O}$  dissolve 0.125 part salt at 15°, and 0.69 part at b. pt.

(Kunheim and Zimmerman — Dingt. polyt. J. 252, 478, '84.)

## CALCIUM FLUORIDE $\text{CaF}_2$ .

1 liter of saturated aqueous solution contains 0.016 gram  $\text{CaF}_2$  at 18°. Determined by the electrolytic method.

(Kohlrausch — Z. physik. Chem. 44, 197, '03.)

## CALCIUM FORMATE $\text{Ca}(\text{HCOO})_2$ .

### SOLUBILITY IN WATER.

(Lumsden — J. Chem. Soc. 81, 355, '02; see also Krasnicki — Monatsh. Chem. 8, 597, '87.)

t°.	Gms. $\text{Ca}(\text{HCOO})_2$ per 100 Gms.		t°.	Gms. $\text{Ca}(\text{HCOO})_2$ per 100 Gms.	
	Water.	Solution.		Water.	Solution.
0	16.15	13.90	60	17.50	14.89
20	16.60	14.22	80	17.95	15.22
40	17.05	14.56	100	18.40	15.53

**CALCIUM HEPTOATE** (Oenanthane)  $\text{Ca}[\text{CH}_3(\text{CH}_2)_6\text{COO}]_2 \cdot \text{H}_2\text{O}$ .

## SOLUBILITY IN WATER.

(Lumaden — J. Chem. Soc. 81, 355, '02; see also Landau — Monatsh. Chem. 14, 712, '93; Altschul — *Ibid.* 17, 575, '96.)

t°.	0°.	20°.	40°.	60°.	80°.	100°.
G. $\text{Ca}(\text{C}_7\text{H}_{15}\text{O}_2)_2$ per 100 gms. solution	0.94	0.85	0.81	0.81	0.97	1.24

**CALCIUM HYDROXIDE**  $\text{Ca}(\text{OH})_2$ .

## SOLUBILITY IN WATER.

(Average curve from the results of Lamy — Ann. chim. phys. [5] 14, 145, '78; Mahen — Pharm. J. Trans [3] 14, 505, '83-84; Herzfeld — Z. Ver Zuckerind. 34, 820, '97, and Guthrie — J. Soc. Chem. Ind. 20, 224, '01.)

t°.	Grams per 100 Grams $\text{H}_2\text{O}$ .		t°.	Grams. per 100 Grams $\text{H}_2\text{O}$ .	
	$\text{Ca}(\text{OH})_2$ .	$\text{CaO}$ .		$\text{Ca}(\text{OH})_2$ .	$\text{CaO}$ .
0	0.185	0.140	50	0.128	0.097
10	0.176	0.133	60	0.116	0.088
20	0.165	0.125	70	0.106	0.080
25	0.159	0.120	80	0.094	0.071
30	0.153	0.116	90	0.085	0.064
40	0.141	0.107	100	0.077	0.058

## SOLUBILITY OF CALCIUM HYDROXIDE IN AQUEOUS SOLUTIONS OF AMMONIUM CHLORIDE AT 25°.

(Noyes and Chapin — Z. physik. Chem. 28, 520, '99.)

Millimols per Liter.		Grams per Liter of Saturated Solution.		
$\text{NH}_4\text{Cl}$ .	$\text{Ca}(\text{OH})_2$ .	$\text{NH}_4\text{Cl}$ .	$\text{Ca}(\text{OH})_2$ =	$\text{CaO}$ .
0.00	20.22	0.00	1.50	1.13
21.76	29.08	1.165	2.16	1.63
43.52	39.23	2.330	2.91	2.20
83.07	59.68	4.447	4.42	3.45

## SOLUBILITY OF CALCIUM HYDROXIDE IN AQUEOUS SOLUTIONS OF CALCIUM CHLORIDE.

(Zaborsky — Z. anorg. Chem. 3, 41, '93; Lunge — J. Soc. Chem. Ind. 11, 882, '92.)

Concentration of $\text{CaCl}_2$ Solutions, Wt. %.	Grams $\text{CaO}$ Dissolved per 100 cc. Solvent at:				
	20°.	40°.	60°.	80°.	100°.
0	0.1374	0.1162	0.1026	0.0845	0.0664
5	0.1370	0.1160	0.1020	0.0936	0.0906
10	0.1661	0.1419	0.1313	0.1328	0.1389
15	0.1993	0.1781	0.1706	0.1736	0.1842
20	0.1857*	0.2249	0.2204	0.2295	0.2325
25	0.1661*	0.3020*	0.2989	0.3261	0.3710
30	0.1630*	0.3680*	0.3664	0.4122	0.4922

\* Indicates cases in which a precipitate of calcium oxychloride separated and thus removed some of the  $\text{CaCl}_2$  from solution.The results in 0%  $\text{CaCl}_2$  solutions, *i.e.*, in pure water, are high when compared with the average results given above.



# CALCIUM HYDROXIDE

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## SOLUBILITY OF CALCIUM HYDROXIDE IN AQUEOUS SOLUTIONS OF POTASSIUM CHLORIDE AND OF SODIUM CHLORIDE.

(Cabot — J. Soc. Chem. Ind. 16, 417, '97.)

Gms. of the Chloride per Liter.	In KCl Solutions.			In NaCl Solutions.		
	Gms. CaO per Liter at:			Gms. CaO per Liter at:		
	0°.	15°.	99°.	0°.	15°.	99°.
0	1.36	1.31	0.635	1.36	1.31	0.635
30	1.701	1.658	0.788	1.813	1.703	0.969
60	1.725	1.674	0.876	...	1.824	1.004
120	1.718	1.606	0.894	1.86	1.722	1.015
240	1.248	1.199	0.617	1.37	1.274	0.771
320	...	...	...	1.054	0.929	0.583

## SOLUBILITY OF LIME IN AQUEOUS SOLUTIONS OF SODIUM CHLORIDE ALONE AND CONTAINING SODIUM HYDROXIDE.

(Margiet — Bull. soc. chim. [3] 33, 631, '05.)

G. NaCl per Liter.	Gms. CaO per Liter of Solution.			G. NaCl per Liter.	Gms. CaO per Liter of Solution.		
	Without NaOH.	0.89. NaOH per Liter.	4.09. NaOH per Liter.		Without NaOH.	0.89. NaOH per Liter.	4.09. NaOH per Liter.
0	1.3	0.8	0.22	150	1.65	1.25	0.44
5	1.4	0.9	...	175	1.6	1.2	...
10	1.6	1.0	...	182	1.6	1.2	...
25	1.7	1.1	...	225	1.4	1.0	...
50	1.8	1.25	...	250	1.3	0.9	...
75	1.9	1.4	0.55	300	1.1	0.7	0.22
100	1.85	1.4	...	...	...	...	...

## SOLUBILITY OF CALCIUM HYDROXIDE IN AQUEOUS SOLUTIONS OF SODIUM HYDROXIDE.

(d'Anselme — Bull. soc. chim. [3] 29, 938, '03.)

Concentration of NaOH:		Grams CaO per Liter Sat. Solution at:			
Normality.	Gms. per Liter	20°.	50°.	70°.	100°.
0	0	1.170	0.880	0.75	0.54
N/100	0.4	0.94	0.65	0.53	0.35
N/25	1.6	0.57	0.35	0.225	0.14
N/15	2.66	0.39	0.20	0.11	0.05
N/8	5.00	0.18	0.06	0.04	0.01
N/5	8.00	0.11	0.02	0.01	trace
N/2	20.00	0.02	trace	0.00	0.00

For results upon mixtures of calcium hydroxide and alkali carbonates and hydroxides, see Bodländer — Z. angew. Chem. 18, 1138, '05.

# SOLUBILITY OF CALCIUM HYDROXIDE IN AQUEOUS SOLUTIONS OF GLYCERINE AT 25°.

(Herz and Knoch — Z. anorg. Chem. 46, 193, '95; for older determinations, see Berthelot — Ann. chim. phys. [3] 46, 176; and Carles — Arch. Pharm. [3] 4, 558, '74.)

Density of Solutions	Wt. per cent Glycerine in Solution.	Millimols $\frac{1}{2}$ Ca(OH) <sub>2</sub> per 100 cc. Solution.	Gms. per 100 cc. Solution.	
			Ca(OH) <sub>2</sub>	CaO.
1.0003	0.0	4.3	0.1593	0.1206
1.0244	7.15	8.13	0.3013	0.2281
1.0537	20.44	14.9	0.5522	0.4180
1.0842	31.55	22.5	0.8339	0.6313
1.1137	40.95	40.1	1.486	1.125
1.1356	48.7	44.0	1.631	1.234
1.2072	69.2	95.8	3.550	2.687

# SOLUBILITY OF LIME IN AQUEOUS SOLUTIONS OF SUGAR.

(Weisberg — Bull. soc. chim. [3] 21, 775, '99.)

The original results were plotted on cross-section paper and the following table constructed from the curves.

1st series, t° = 16'–17°.

Gms. per 100 Gms. Solution.		G. CaO per 100 Gms. Sugar in Sol.
Sugar.	CaO.	
1	0.30	35.0
2	0.56	28.7
3	0.85	28.0
4	1.12	27.7
5	1.40	27.5
6	1.65	27.5
8	2.22	27.5
10	2.77	27.5
12	3.27	27.5
14	3.85	27.5

2d, series t° = 15°.

Gms. per 100 Gms. Solution.		G. CaO per 100 Gms. Sugar in Sol.
Sugar.	CaO.	
1	0.50	62.5
2	0.75	36.0
3	1.02	32.5
4	1.22	30.2
5	1.45	28.5
6	1.67	27.7
8	2.22	27.5
10	2.77	27.5
12	3.27	27.5
14	3.85	27.5

In the second series a very much larger excess of lime was used than in the first series. The author gives results in a subsequent paper, — Bull. soc. chim. [3] 23, 740, '00, — which show that the solubility is also affected by the condition of the calcium compound used, *i.e.*, whether the oxide, hydrate, or milk of lime is added to the sugar solutions.

# CALCIUM IODATE

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## CALCIUM IODATE $\text{Ca}(\text{IO}_3)_2 \cdot 6\text{H}_2\text{O}$ .

### SOLUBILITY IN WATER.

(Mylius and Funk — Ber. 30, 1724, '97; W. Abh. p. 1. Reichenstalt 3, 448, '00.)

t °.	Gms. $\text{Ca}(\text{IO}_3)_2$ per 100 Gms. Sol.	Mols. $\text{Ca}(\text{IO}_3)_2$ per 100 Mols. $\text{H}_2\text{O}$ .	Solid Phase.	t °.	Gms. $\text{Ca}(\text{IO}_3)_2$ per 100 Gms. Sol.	Mols. $\text{Ca}(\text{IO}_3)_2$ per 100 Mols. $\text{H}_2\text{O}$ .	Solid Phase.
0	0.10	0.0044	$\text{Ca}(\text{IO}_3)_2 \cdot 6\text{H}_2\text{O}$	21	0.37	0.016	$\text{Ca}(\text{IO}_3)_2 \cdot \text{H}_2\text{O}$
10	0.17	0.0075	"	35	0.48	0.021	"
18	0.25	0.011	"	40	0.52	0.023	"
30	0.42	0.019	"	45	0.54	0.024	"
40	0.61	0.027	"	50	0.59	0.026	"
50	0.89	0.040	"	60	0.65	0.029	"
54	1.04	0.046	"	80	0.79	0.034	"
60	1.36	0.063	"	100	0.94	0.042	"

Density of solution saturated at 18° = 1.00.

## CALCIUM IODIDE $\text{CaI}_2$ .

### SOLUBILITY IN WATER.

(Average curve from the results of Kremers — Pogg. Ann. 103, 65, '58; Etard — Ann. chim. phys. [7] 2, 532, '94.)

t °.	Gms. $\text{CaI}_2$ per 100 Gms. Solution.	t °.	Gms. $\text{CaI}_2$ per 100 Gms. Solution.	t °.	Gms. $\text{CaI}_2$ per 100 Gms. Solution.
0	64.6	30	69	80	78
10	66.0	40	70.8	100	81
20	67.6	60	74		

Density of solution saturated at 20° = 2.125.

## CALCIUM (Neutral) MALATE $\text{Ca}(\text{C}_4\text{H}_4\text{O}_5)_2 \cdot 3\text{H}_2\text{O}$ .

## CALCIUM (Acid) MALATE $\text{Ca}(\text{C}_4\text{H}_3\text{O}_5)_2 \cdot 6\text{H}_2\text{O}$ .

## CALCIUM MALONATE $\text{Ca}(\text{C}_3\text{H}_2\text{O}_4)_2 \cdot 4\text{H}_2\text{O}$ .

### SOLUBILITY OF EACH IN WATER.

(Iwig and Hecht — Liebigs Ann. 233, 167, '86; Cantoni and Basadonna — Bull. soc. chim. [3] 35, 731, '06; the malonate, Miczynski — Monatsh. Chem. 7, 261, '86.)

Ca. Neutral Malate.				Ca. Acid Malate.		Ca. Malonate.
t °.	Gms. $\text{Ca}(\text{C}_4\text{H}_4\text{O}_5)_2$ per 100.			Gms. $\text{Ca}(\text{C}_4\text{H}_3\text{O}_5)_2$ per 100 Gms.		Gms. $\text{Ca}(\text{C}_3\text{H}_2\text{O}_4)_2$ per 100 Gms. $\text{H}_2\text{O}$ .
	Gms. $\text{H}_2\text{O}$ .	Gms. Sol.	cc. Sol. (C and B).	Water.	Solution.	
0	...	...	...	...	...	0.290
10	0.85	0.84	...	1.8	1.77	0.330
20	0.82	0.81	0.907	1.5	1.48	0.365
30	0.78	0.77	0.835	2.0	1.96	0.396
40	0.74	0.73	0.816	5.2	4.94	0.422
50	0.66	0.65	0.809	15.0	13.09	0.443
57	0.57	0.56	...	32.24	24.29	...
60	0.58	0.58	0.804	26.0	20.64	0.460
70	0.63	0.63	0.795	11.0	9.91	0.472
80	0.71	0.70	0.754	6.8	6.37	0.479
90	...	...	0.740	...	...	

### SOLUBILITY OF CALCIUM MALATE IN WATER AND IN ALCOHOL.

(Partheil and Hübner — Archiv. Pharm. 241, 413, '03.)

100 grams  $\text{H}_2\text{O}$  dissolve 0.9214 gram  $\text{CaC}_4\text{H}_4\text{O}_5 \cdot \text{H}_2\text{O}$  at 18°, and 0.8552 gram at 25°.

100 grams 95% alcohol dissolve 0.0049 gram  $\text{CaC}_4\text{H}_4\text{O}_5 \cdot \text{H}_2\text{O}$  at 18°, and 0.00586 gram at 25°.

**CALCIUM NITRATE**  $\text{Ca}(\text{NO}_3)_2 \cdot 2\text{H}_2\text{O}$ .

## SOLUBILITY IN WATER AT 18°.

(Mylius and Funk — Ber. 30, 1718, '97.)

100 grams saturated solution contain 54.8 grams  $\text{Ca}(\text{NO}_3)_2$ . Density of solution, 1.548.

**CALCIUM OXALATE**  $\text{Ca}(\text{COO})_2 \cdot \text{H}_2\text{O}$ .

## SOLUBILITY IN WATER, BY ELECTROLYTIC CONDUCTIVITY METHOD.

(Holleman, Kohlrausch, and Rose — Z. physik. Chem. 12, 120, 241, '03; Richards, McCaffrey, and Bisbee — Z. anorg. Chem. 28, 85, '01.)

t°.	Gms. $\text{CaC}_2\text{O}_4$ per Liter of Solution.	t°.	Gms. $\text{CaC}_2\text{O}_4$ per Liter of Solution.
13	0.0067 (H)	25	0.0068 (R, McC and B)
18	0.0056 (K and R)	50	0.0095 “
24	0.0080 (H)	95	0.0140 “

## SOLUBILITY OF CALCIUM OXALATE IN AQUEOUS SOLUTIONS OF ACETIC ACID AT 26°–27°.

(Herz and Muhs — Ber. 36, 3715, '03.)

Normality of Acetic Acid.	G. $\text{CH}_3\text{COOH}$ per 100 cc. Sol.	Residue from 50.052 cc. Solution.
0	0.00	0.0017
0.58	3.48	0.0048
2.89	17.34	0.0058
5.79	34.74	0.0064

The residues were dried at 70° C.

**CALCIUM OXIDE.** See Calcium Hydroxide, p. 91.

**CALCIUM PHOSPHATE** (Tribasic)  $\text{Ca}_3(\text{PO}_4)_2$ .

## SOLUBILITY IN WATER.

The determinations of the solubility of this salt in water, as stated in the literature, are found to vary within rather wide limits, due, no doubt, to the fact that so-called tribasic calcium phosphate is apparently a solid solution of the dibasic salt and calcium oxide, and therefore analyses of individual samples may show an excess of either lime or phosphoric acid. When placed in contact with water, more  $\text{PO}_4$  ions enter solution than Ca ions, the resulting solution being acid in reaction and the solid phase richer in lime than it was, previous to being added to the water. For material having a composition approximating closely that represented by the formula  $\text{Ca}_3(\text{PO}_4)_2$ , the amount which is dissolved by  $\text{CO}_2$  free water at the ordinary temperature, as calculated from the calcium determination, is 0.01 to 0.10 gram per liter, depending upon the conditions of the experiment. Water saturated with  $\text{CO}_2$  dissolves 0.15 to 0.30 gram per liter.

A list of references to papers on this subject is given by Cameron and Hurst — J. Am. Chem. Soc. 26, 903, '04; see also Cameron and Bell, *Ibid.* 27, 1512, '05.

## CALCIUM PHOSPHATE

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### CALCIUM PHOSPHATE (Dibasic) $\text{CaHPO}_4 \cdot 2\text{H}_2\text{O}$ .

#### SOLUBILITY IN WATER.

(Cameron and Seidell — J. Am. Chem. Soc. 26, 1460, '04; see also Rindell — Compt. rend. 134, 112, '02; Magnanini — Gazz. chim. ital. 31, II, 544, '01.)

1 liter of  $\text{CO}_2$  free water dissolves 0.136 gram  $\text{CaHPO}_4$  at  $25^\circ$ .

1 liter of water sat. with  $\text{CO}_2$  dissolves 0.561 gram  $\text{CaHPO}_4$  at  $25^\circ$ .

### SOLUBILITY OF DI CALCIUM PHOSPHATE AND OF MONO CALCIUM PHOSPHATE IN AQUEOUS SOLUTIONS OF PHOSPHORIC ACID AT $25^\circ$ .

(Cameron and Seidell — J. Am. Chem. Soc. 27, 1508, '05; Causse — Compt. rend. 114, 414, '92.)

Grams per Liter of Solution.		Gms. per Liter		$\text{P}_2\text{O}_5$ per Liter in Excess of that combined with Ca.	Solid Phase.
CaO.	$\text{P}_2\text{O}_5$ .	Calc. from CaO	Found.		
1.71	4.69	4.15	$\text{CaHPO}_4$	2.53	$\text{CaHPO}_4 \cdot 2\text{H}_2\text{O}$
11.57	36.14	28.05	"	21.5	"
23.31	75.95	56.53	"	46.45	"
39.81	139.6	97.01	"	89.0	"
49.76	191.0	120.7	"	128.0	"
59.40	234.6	144.1	"	159.4	"
70.31	279.7	170.6	"	190.7	"
77.00	317.0	{ 174.2	$\text{CaHPO}_4$ or	226.0	$\text{CaHPO}_4 \cdot 2\text{H}_2\text{O} +$
		{ 321.3	$\text{CaH}_2(\text{PO}_4)_2$	122.2	$\text{CaH}_2(\text{PO}_4)_2 \cdot \text{H}_2\text{O}$
72.30	351.9	301.6	$\text{CaH}_2(\text{PO}_4)_2$	169.0	$\text{CaH}_2(\text{PO}_4)_2 \cdot \text{H}_2\text{O}$
69.33	361.1	289.3	"	186.1	"
59.98	419.7	250.2	"	267.9	"
53.59	451.7	223.7	"	316.1	"
44.52	505.8	185.8	"	393.1	"
39.89	538.3	166.4	"	437.4	"

Density of the solution in contact with both salts at  $25^\circ = 1.29$ .

### SOLUBILITY OF DI CALCIUM PHOSPHATE IN AQUEOUS N/200 SOLUTION OF ACID POTASSIUM TARTRATE AT $25^\circ$ .

(Magnanini.)

1 liter of the solution contains 0.08 gram Ca = 0.235 gram  $\text{CaHPO}_4$ .

### CALCIUM PHOSPHATE (Monobasic) $\text{CaH}_2(\text{PO}_4)_2 \cdot \text{H}_2\text{O}$ .

#### SOLUBILITY IN WATER.

This salt is stable in contact with the aqueous solution only when there is present free phosphoric acid to the extent indicated by the above table.

### CALCIUM PELARGONATE (Nonate) $\text{Ca}[\text{CH}_2(\text{CH}_2)_7\text{COO}]_2 \cdot \text{H}_2\text{O}$ .

### CALCIUM PROPIONATE $\text{Ca}(\text{CH}_2\text{CH}_2\text{COO})_2 \cdot \text{H}_2\text{O}$ .

#### SOLUBILITY OF EACH IN WATER.

(Lumsden — J. Chem. Soc. 81, 355, '02; Krasnicki — Monatsb. Chem. 8, 597, '87.)

Calcium Pelargonate.			Calcium Propionate.	
t°.	Grams $\text{Ca}[\text{CH}_2(\text{CH}_2)_7\text{COO}]_2$ per 100 Grams $\text{H}_2\text{O}$ .		Grams $\text{Ca}(\text{CH}_2\text{CH}_2\text{COO})_2$ per 100 Grams.	
			Water.	Solution.
0	0.16		42.80	29.97
20	0.14		39.85	28.48
40	0.13		38.45	27.76
60	0.12		38.25	27.67
80	0.15		39.85	28.48
90	0.18		42.15	29.66
100	0.26		48.44	32.63

**CALCIUM SELENATE**  $\text{CaSeO}_4$ .

## SOLUBILITY IN WATER.

(Etard — Ann. chim. phys. [7] 2, 532, '94.)

t°.	-1°.	+5°.	20°.	37°.	67°.
Gms. per 100 gms. sol.	7.4	7.3	7.6	6.8	5.1

The accuracy of these results appears questionable.

**CALCIUM SILICATE**  $\text{CaSiO}_3$ .

## SOLUBILITY IN WATER AND IN AQUEOUS SUGAR SOLUTIONS AT 17°.

(Weisberg — Bull. soc. chim. [3] 15, 1097, '96.)

The sample of calcium silicate was air dried.

Solvent.	Grams per 100 cc. Saturated Solution.			
	At 17°.		After Boiling and Filtering Hot.	
	CaO(det.)	CaSiO <sub>3</sub> (calc.)	CaO(det.)	CaSiO <sub>3</sub> (calc.)
Water	0.0046	0.0095	...	...
10% sugar sol.	0.0065	0.0135	0.0094	0.0195
20% sugar sol.	0.0076	0.0157	0.0120	0.0249

**CALCIUM SUCCINATE**  $\text{Ca}(\text{C}_2\text{H}_3\text{O}_2)_2$ .**CALCIUM (Iso) SUCCINATE**  $\text{CaCH}_2\text{CHC}_2\text{O}_4\cdot\text{H}_2\text{O}$ .

## SOLUBILITY OF EACH IN WATER.

(Miczynski — Monatsh. Chem. 7, 261, '86.)

Calcium Succinate.			Calcium Iso Succinate.		
t°.	Gms. $\text{Ca}(\text{C}_2\text{H}_3\text{O}_2)_2$ per 100 Gms. $\text{H}_2\text{O}$ .	t°.	Gms. $\text{Ca}(\text{C}_2\text{H}_3\text{O}_2)_2$ per 100 Gms. $\text{H}_2\text{O}$ .	t°.	Gms. $\text{Ca}(\text{C}_2\text{H}_3\text{O}_2)_2$ per 100 Gms. $\text{H}_2\text{O}$ .
0	1.127	50	1.029	0	0.522
10	1.220	60	0.894	10	0.524
20	1.276	70	0.770	20	0.517
40	1.177	80	0.657	40	0.475
				50	0.440
				60	0.396
				70	0.342
				80	0.279

100 cc.  $\text{H}_2\text{O}$  dissolve 1.424 grams succinate ( $\text{CaC}_4\text{H}_4\text{O}_4\cdot\text{H}_2\text{O}$ ) at 18°, and 1.436 grams at 25°.100 cc. 95% alcohol dissolve 0.00136 gram succinate ( $\text{CaC}_4\text{H}_4\text{O}_4\cdot\text{H}_2\text{O}$ ) at 18°, and 0.00136 gram at 25°.

(Partheil and Hübner — Archiv. Pharm. 241, 413, '03.)

**CALCIUM SULPHATE**  $\text{CaSO}_4\cdot 2\text{H}_2\text{O}$ .

## SOLUBILITY IN WATER.

(Hulett and Allen — J. Am. Chem. Soc. 24, 674, '02; for references to other determinations see Hulett and Allen, also Euler — Z. physik. Chem. 49, 313, '04. Determinations by the electrolytic conductivity method Holleman, Kohlrausch and Rose — Z. physik. Chem. 12, 129, 241, '93.)

t°.	Gms. $\text{CaSO}_4$ per 100 cc. Solution.	Millimols. per Liter.	Density of Solutions.	t°.	Gms. $\text{CaSO}_4$ per 100 cc. Solution.	Millimols. per Liter.	Density of Solutions.
0	0.1759	12.926	1.00197	40	0.2097	15.413	0.99439
10	0.1928	14.177	1.00173	55	0.2009	14.765	0.98796
18	0.2016	14.817	1.00059	65.3	0.1932	14.200	0.98256
25	0.2080	15.295	0.99911	75	0.1847	13.575	0.97772
30	0.2090	15.361	0.99789	100	0.1619	11.900	...
35	0.2096	15.405	0.99789	107	...	11.390	...

# CALCIUM SULPHATE

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## SOLUBILITY OF CALCIUM SULPHATE IN AQUEOUS SOLUTIONS OF HYDROCHLORIC, NITRIC, CHLOR ACETIC, AND FORMIC ACIDS.

(Banthisch — J. pr. Chem. 29, 52, '84; Lunge — J. Soc. Chem. Ind. 4, 32, '85.)

Grams Acid per 100 cc. Solution.	In Hydrochloric.		In Nitric.	In Chlor Acetic.	In Formic.
	Grams CaSO <sub>4</sub> per 100 cc. Sol. at 25°. at 102°.		Gms. CaSO <sub>4</sub> per 100 cc. Solution at 25°.	Gms. CaSO <sub>4</sub> per 100 cc. Sol. at 25°.	Gms. CaSO <sub>4</sub> per 100 cc. Sol. at 25°.
0	0.208	0.160	0.208	0.208	0.208
1	0.72	1.38	0.56	...	...
2	1.02	2.38	0.82	...	...
3	1.25	3.20	1.02	...	...
4	1.42	3.64	1.20	0.22	0.24
6	1.65	4.65	1.48	...	...
8	1.74	...	1.70	...	...
10	...	...	1.84	0.25	...
12	...	...	1.98	...	...

## SOLUBILITY OF CALCIUM SULPHATE IN AQUEOUS SOLUTIONS OF PHOSPHORIC ACID AT 25°.

(Taber — page 61, Bull. 33, Bureau of Soils — U. S. Dept. Agr., 1906.)

Gms. per Liter.		Sp. Gr. of Solutions at 25°.	Gms. per Liter.		Sp. Gr. of Solutions at 25°.
P <sub>2</sub> O <sub>5</sub> .	CaSO <sub>4</sub> .		P <sub>2</sub> O <sub>5</sub> .	CaSO <sub>4</sub> .	
0.0	2.126	0.9991	145.1	7.920	1.106
5.0	3.143	1.002	205.0	8.383	1.145
10.5	3.734	1.007	311.5	7.965	1.221
21.4	4.456	1.016	395.8	6.848	1.280
46.3	5.760	1.035	494.6	5.572	1.344
105.3	7.318	1.075			

## SOLUBILITY OF CALCIUM SULPHATE IN AQUEOUS SOLUTIONS OF SULPHURIC ACID.

(Cameron and Breazeale — J. Physic. Chem. 7, 574, '03.)

Grams H <sub>2</sub> SO <sub>4</sub> per Liter of Solution.	Results at 25°.		Results at 35°.	Results at 43°.
	Gms. CaSO <sub>4</sub> per Liter.	Wt. of 1 cc. Sol.	Gms. CaSO <sub>4</sub> per Liter.	Gms. CaSO <sub>4</sub> per Liter.
0.00	2.126	0.9991	...	2.145
0.48	2.128	1.0025	2.209	2.236
4.87	2.144	1.0026	2.451	2.456
8.11	2.203	1.0051	...	2.760
16.22	2.382	1.0098	...	3.116
48.67	2.727	1.0302	3.397	3.843
75.00	2.841	1.0435	...	4.146
97.35	2.779	1.0756	3.606	...
146.01	2.571	...	3.150	4.139
194.70	2.313	1.1134	...	3.551
243.35	1.901	1.1418	...	2.959
292.02	1.541	1.1681	...	2.481

### SOLUBILITY OF CALCIUM SULPHATE IN AQUEOUS SOLUTIONS OF AMMONIUM SALTS.

(In  $\text{NH}_4\text{Cl}$  and  $\text{NH}_4\text{NO}_3$ , Cameron and Brown — J. Physic. Chem. 9, 210, '05; In  $(\text{NH}_4)_2\text{SO}_4$  at 25°, Sullivan — J. Am. Chem. Soc. 27, 529, '05; In  $(\text{NH}_4)_2\text{SO}_4$  at 50°, Bell and Tabor — J. Physic. Chem. 10, 119, '06.)

Gms. Ammonium Salt per Liter.	In $\text{NH}_4\text{Cl}$ at 25°.	In $\text{NH}_4\text{NO}_3$ at 25°.	Gms. Ammonium Salt per Liter.	In $\text{NH}_4\text{Cl}$ at 25°.	In $\text{NH}_4\text{NO}_3$ at 25°.
	G. $\text{CaSO}_4$ Dissolved per Liter.	G. $\text{CaSO}_4$ Dissolved per Liter.		G. $\text{CaSO}_4$ Dissolved per Liter.	G. $\text{CaSO}_4$ Dissolved per Liter.
0	2.08	2.08	300	10.10	10.80
20	5.00	3.70	375	7.40	...
40	7.00	5.10	400	...	11.40
60	8.00	6.05	600	...	12.15
80	8.50	7.00	800	...	12.10
100	9.10	7.65	1000	...	11.81
150	10.30	8.88	1400	...	10.02
200	10.85	9.85	sat.	...	7.55

In  $(\text{NH}_4)_2\text{SO}_4$  at 25°.

Grams per Liter Sol.	Wt. of 100 cc. Sat. Sol.
$(\text{NH}_4)_2\text{SO}_4$ . $\text{CaSO}_4$ .	
0.00	99.91
0.129	99.91
0.258	99.92
0.821	99.95
1.643	99.99
3.287	100.10
6.575	100.34
13.15	100.82
26.30	101.76
84.9	105.34
169.8	110.32
339.6	119.15

In  $(\text{NH}_4)_2\text{SO}_4$  at 50°.

Grams per Liter Sol.	Sp. Gr. of Solutions.
$(\text{NH}_4)_2\text{SO}_4$ . $\text{CaSO}_4$ .	
0.00	...
15.65	1.0026
30.67	1.0113
91.6	1.0440
160.4	1.0819
221.6	1.1108
340.6	1.1653
416.5	1.1964
428.4	1.2043
530.8	1.2437
566.0	1.2508
566.7	1.2510

### SOLUBILITY OF CALCIUM SULPHATE IN AQUEOUS SOLUTIONS OF CALCIUM SALTS AT 25°.

(Cameron and Seidell — J. Physic. Chem. 5, 643, '01; Seidell and Smith — *Ibid.* 8, 493, '04; Cameron and Bell — J. Am. Chem. Soc. 28, 1220, '06.)

In Calcium Chloride.		In Calcium Nitrate.			In Calcium Hydroxide and vice versa.		
Grams per Liter Sol.		Gms. per Liter Sol.		Wt. of 1 cc. Sol.	Gms. per Liter Sol.		Solid Phase.
$\text{CaCl}_2$ .	$\text{CaSO}_4$ .	$\text{Ca}(\text{NO}_3)_2$ .	$\text{CaSO}_4$ .		$\text{CaO}$ .	$\text{CaSO}_4$ .	
0.00	2.06	0.0	2.08	0.998	0.0	2.126	$\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
7.49	1.24	25	1.24	1.014	0.062	2.030	"
11.96	1.18	50	1.20	1.032	0.176	1.918	"
25.77	1.10	100	1.13	1.067	0.349	1.853	"
32.05	1.08	200	0.93	1.137	0.61	1.722	"
51.53	1.02	300	0.76	1.204	0.939	1.634	"
97.02	0.84	400	0.57	1.265	1.222	1.588	$\text{CaSO}_4 \cdot 2\text{H}_2\text{O} + \text{Ca}(\text{OH})_2$
192.71	0.47	500	0.40	1.328	1.242	1.214	
280.30	0.20	544	0.35	1.352	1.150	0.666	
367.85	0.03	...	...	...	1.166	0.00	

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# CALCIUM SULPHATE

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## SOLUBILITY OF CALCIUM SULPHATE IN AQUEOUS SOLUTIONS OF MAGNESIUM CHLORIDE AND OF MAGNESIUM NITRATE AT 25°.

(Cameron, Seidell, and Smith.)

### In Magnesium Chloride.

Grams per Liter of Sat. Solution.		
MgCl <sub>2</sub> .	CaSO <sub>4</sub> .	H <sub>2</sub> O.
0.0	2.08	997.9
8.50	4.26	996.5
19.18	5.69	994.5
46.64	7.59	989.1
121.38	8.62	972.2
206.98	6.57	949.9
337.0	2.77	908.7
441.1	1.39	878.6

### In Magnesium Nitrate.

Gms. per Liter Sol.		Wt. of 1 cc. Solution.
Mg(NO <sub>3</sub> ) <sub>2</sub> .	CaSO <sub>4</sub> .	
0.0	2.08	0.9981
25	5.77	1.0205
50	7.88	1.0398
100	9.92	1.0786
200	13.34	1.1498
300	14.00	1.2190
400	14.68	1.2821
514	15.04	1.3553

## SOLUBILITY OF CALCIUM SULPHATE IN AQUEOUS SOLUTIONS OF MAGNESIUM SULPHATE AT 25°.

(Cameron and Bell — J. Physic. Chem. 10, 210, '06.)

Grams per Liter Solution.		Sp. Gr. of Solutions at 15°.	Grams per Liter Solution.		Sp. Gr. of Solutions at 15°.
MgSO <sub>4</sub> .	CaSO <sub>4</sub> .		MgSO <sub>4</sub> .	CaSO <sub>4</sub> .	
0.0	2.046	1.0032	149.67	1.597	1.1377
3.20	1.620	1.0055	165.7	1.549	1.1479
6.39	1.507	1.0090	171.2	1.474	1.1537
10.64	1.471	1.0118	198.8	1.422	1.1813
21.36	1.478	1.0226	232.1	1.254	1.2095
42.68	1.558	1.0419	265.6	1.070	1.2382
64.14	1.608	1.0626	298.0	0.860	1.2624
85.67	1.617	1.0833	330.6	0.647	1.2877
128.28	1.627	1.1190	355.0	0.501	1.3023

## SOLUBILITY OF CALCIUM SULPHATE IN AQUEOUS SOLUTIONS OF POTASSIUM CHLORIDE, BROMIDE, AND IODIDE AT 21°.

(Ditte — Ann. chim. phys. [7] 14, 294, '98.)

### In KCl Solutions. In KBr Solutions. In KI Solutions.

Grams of the Potassium Salt per Liter.	Gms. CaSO <sub>4</sub> per Liter.	Gms. CaSO <sub>4</sub> per Liter.	Gms. CaSO <sub>4</sub> per Liter.
0	2.05	2.05	2.05
10	3.6	3.1	2.8
20	4.5	3.6	3.2
40	5.8	4.5	3.9
60	6.6	5.2	4.5
80	7.2	5.9	4.85
100	7.5	6.3	5.1
125	double salt	6.7	5.45
150	...	7.0	5.8
200	...	7.3	5.95
250	...	double salt	6.00
300	...	...	double salt

**SOLUBILITY OF CALCIUM SULPHATE IN AQUEOUS SOLUTIONS OF POTASSIUM NITRATE AND OF POTASSIUM SULPHATE AT 25°.**

(Seidell and Smith — J. Physic. Chem. 8, 493, '04; Cameron and Breazeale — *Ibid.* 8, 335, '04.)

In Potassium Nitrate.			In Potassium Sulphate.		
Gms. per Liter Solution.		Wt. of 1 cc. Solution.	Gms. per Liter Solution.		Wt. of 1 cc. Solution.
KNO <sub>3</sub> .	CaSO <sub>4</sub> .		K <sub>2</sub> SO <sub>4</sub> .	CaSO <sub>4</sub> .	
0.0	2.08	0.9981	0.0	2.08	0.9981
12.5	3.28	1.0081	4.88	1.60	1.0036
25.0	4.08	1.0154	5.09	1.56	1.0038
50.0	5.26	1.0321	9.85	1.45	1.0075
100.0	6.86	1.0625	19.57	1.49	1.0151
150	7.91	1.0924	28.35	1.55	1.0229
200	8.69	1.1224	30.66	1.57	1.0236
260	syngenite	1.1539	32.47	1.58*	...

\* Solid phase syngenite. Results for the solubility of syngenite in solutions of potassium sulphate are also given in the original paper.

**SOLUBILITY OF CALCIUM SULPHATE IN AQUEOUS SOLUTIONS OF SODIUM CHLORIDE AT 26°.**

(Cameron — J. Physic. Chem. 5, 556, '01; see this paper for references to other work, also Orloff — J. russ. phys. chem. Ges. 37, 949, '02; Cloez — Bull. soc. chim. [3] 29, 167, '03; d'Anselme — *Ibid.* [3] 29, 372, '03.)

Grams per 100 cc. Solution.		Wt. of 1 cc. Solution.	Grams per 100 cc. Solution.		Wt. of 1 cc. Solution.
NaCl.	CaSO <sub>4</sub> .		NaCl.	CaSO <sub>4</sub> .	
0.00	0.2121	0.9998	17.650	0.712	1.1196
9.115	0.666	1.0644	22.876	0.679	1.1488
14.399	0.718	1.0981	26.417	0.650	1.1707
14.834	0.716	1.1012	32.049	0.572	1.2034

**SOLUBILITY OF MIXTURES OF CALCIUM SULPHATE AND CALCIUM CARBONATE IN AQUEOUS SOLUTIONS OF SODIUM CHLORIDE AT 23°.**

(Cameron and Seidell — J. Physic. Chem. 5, 643, '01.)

Grams per Liter Solution.			Grams per Liter Solution.		
NaCl.	Ca(HCO <sub>3</sub> ) <sub>2</sub> .	CaSO <sub>4</sub> .	NaCl.	Ca(HCO <sub>3</sub> ) <sub>2</sub> .	CaSO <sub>4</sub> .
0.00	0.060	1.930	79.52	0.060	6.424
3.63	0.072	2.720	121.90	0.056	5.272
11.49	0.089	3.446	193.80	0.048	4.786
39.62	0.101	5.156	267.60	0.040	4.462

**SOLUBILITY OF MIXTURES OF CALCIUM SULPHATE AND SILVER SULPHATE IN WATER.**

(Euler — Z. physik. Chem. 49, 313, '04.)

t°.		Per Liter of Solution.		Total Salt per 100 Gms. Solution.	Sp. Gr. of Solutions.
		Gms. Salt.	Gms. Equiv. Salt.		
17°	{ CaSO <sub>4</sub>	2.31	0.034	0.9473	1.0083
	{ Ag <sub>2</sub> SO <sub>4</sub>	7.235	0.0464		
25°	{ CaSO <sub>4</sub>	2.61	0.0383	1.062	1.010
	{ Ag <sub>2</sub> SO <sub>4</sub>	8.11	0.0520		

# CALCIUM SULPHATE

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## SOLUBILITY OF CALCIUM SULPHATE IN AQUEOUS SOLUTIONS OF SODIUM NITRATE AND OF SODIUM SULPHATE AT 25°.

(Seidell, Smith, Cameron, Brazeale.)

In Sodium Nitrate.			In Sodium Sulphate.		
Grams per Liter Solution.		Wt. of 1 cc. Solution.	Grams per Liter Solution.		Wt. of 1 cc. Solution.
NaNO <sub>3</sub> .	CaSO <sub>4</sub> .		Na <sub>2</sub> SO <sub>4</sub> .	CaSO <sub>4</sub> .	
0	2.08	0.9981	2.39	1.65	1.0013
25	4.25	1.0163	9.54	1.45	1.0076
50	5.50	1.0340	14.13	1.39	1.0115
100	7.10	1.0684	24.37	1.47	1.0205
200	8.79	1.1336	46.15	1.65	1.0391
300	9.28	1.1916	115.08	2.10	1.0965
600	7.89	1.3639	146.61	2.23	1.1427
655	7.24	1.3904	257.10	2.65	1.2120

## SOLUBILITY OF CALCIUM SULPHATE IN AQUEOUS AND ALCOHOLIC MONO POTASSIUM TARTRATE SOLUTIONS AT 20°.

(Magnanini — Gazz. chim. ital. 31, II, 544, '01.)

Solvent.	Gms. CaSO <sub>4</sub> per 100 Gms. Solution.	Solvent.	Gms. CaSO <sub>4</sub> per 100 Gms. Solution.
Water	0.2238	10% alcoholic N/200 KHC <sub>2</sub> H <sub>4</sub> O <sub>6</sub>	0.0866
Aq. N/200 KHC <sub>2</sub> H <sub>4</sub> O <sub>6</sub>	0.2323	Aq. N/200 KHC <sub>2</sub> H <sub>4</sub> O <sub>6</sub> + 5% tartaric ac.	0.2566
10 per cent alcohol	0.0970	10% alc. N/400 KHC <sub>2</sub> H <sub>4</sub> O <sub>6</sub> + 5% tartaric ac.	0.1086

## SOLUBILITY OF CALCIUM SULPHATE IN AQUEOUS SUGAR SOLUTIONS.

(Stolle — Z. Ver. Zuckerind. 50, 331, '00.)

Per cent Concentration of Sugar Solutions.	Grams CaSO <sub>4</sub> Dissolved by 1 Liter of the Sugar Solutions at:					
	30°.	40°.	50°.	60°.	70°.	80°.
0	...	2.157	1.730	1.730	1.652	1.710
10	2.041	1.730	1.730	1.574	1.574	1.613
20	1.808	1.652	1.419	1.380	1.419	1.263
27	1.550	1.438	1.361	1.283	1.283	0.972
35	1.263	1.050	1.088	1.108	0.914	...
42	1.030	...	0.777	0.816	0.855	0.729
49	...	0.564	0.739	0.564	0.603	0.486
55	...	0.486	0.505	0.486	0.369	0.330

# CALCIUM SULPHIDE CaS.

## SOLUBILITY IN AQUEOUS SUGAR SOLUTIONS.

(Stolle.)

Per cent Concentration of Sugar Solutions.	Grams CaS Dissolved per Liter of the Sugar Solutions at:						
	30°.	40°.	50°.	60°.	70°.	80°.	90°.
0	1.982	2.123	1.235	1.390	1.696	2.032	2.496
10	1.866	1.316	1.441	1.673	1.560	1.634	1.544
20	2.187	1.696	1.802	1.905	1.879	1.892	1.930
27	2.522	2.097	2.059	2.226	2.342	2.304	2.357
35	2.689	2.265	2.304	2.406	2.342	2.857	2.947
42	2.342	2.136	2.226	2.522	2.574	2.509	2.689
49	2.445	2.290	2.458	2.638	2.728	2.818	3.063
55	2.509	2.226	2.340	2.882	2.766	2.972	3.616

**CALCIUM SULPHITE**  $\text{CaSO}_3$ .

SOLUBILITY IN WATER AND IN AQUEOUS SUGAR SOLUTIONS AT 18°.  
(Weisberg — Bull. soc. chim. [3] 15, 1097, '96.)

Solvent.	Grams $\text{CaSO}_3$ per 100 cc. Solution.	
	At 18°.	After Boiling Solution 2 Hours.
Water	0.0043	...
10 Per cent Sugar	0.0083	0.0066
30 Per cent Sugar	0.0080	0.0069

**CALCIUM TARTRATE**  $\text{CaC}_4\text{H}_4\text{O}_6 \cdot 4\text{H}_2\text{O}$ .

SOLUBILITY IN WATER.

(Cantoni and Zachoder — Bull. soc. chim. [3] 33, 747, '05.)

t°.	Gms. $\text{CaC}_4\text{H}_4\text{O}_6 \cdot 4\text{H}_2\text{O}$ per 100 cc. Sol.	t°.	Gms. $\text{CaC}_4\text{H}_4\text{O}_6 \cdot 4\text{H}_2\text{O}$ per 100 cc. Sol.	t°.	Gms. $\text{CaC}_4\text{H}_4\text{O}_6 \cdot 4\text{H}_2\text{O}$ per 100 cc. Sol.
0	0.0365	30	0.0631	70	0.1430
10	0.0401	40	0.0875	80	0.1798
20	0.0475	50	0.1100	85	0.2190
25	0.0525	60	0.1262		

100 gms. aq. Ca. tartrate solution contain 0.0185 g.  $\text{CaC}_4\text{H}_4\text{O}_6 \cdot 4\text{H}_2\text{O}$  at 18°, and 0.029489 at 25°.

100 gms. 95% alcohol solution contain 0.0187 g.  $\text{CaC}_4\text{H}_4\text{O}_6 \cdot 4\text{H}_2\text{O}$  at 18°, and 0.02352 at 25°.

(Partheil and Hübner — Archiv. Pharm. 241, 413, '03.)

100 gms. aq. Ca. tartrate solution contain 0.0364 g.  $\text{CaC}_4\text{H}_4\text{O}_6$  at 20°.

100 gms. 10% alcohol solution contain 0.0160 g.  $\text{CaC}_4\text{H}_4\text{O}_6$  at 20°.

100 gms. 10% alcohol + 5% tartaric acid solution contain 0.1632 g.  $\text{CaC}_4\text{H}_4\text{O}_6$  at 20°.

(Magnanini — Gazz. chim. ital. 31, II, 544, '01.)

SOLUBILITY OF CALCIUM TARTRATE IN AQUEOUS ACETIC ACID

SOLUTIONS AT 26°–27°.

(Herz and Muhs — Ber. 36, 3715, '03; see also Enell — Pharm. Centrallh. 38, 181; Z. anal. Chem. 38, 368, '99.)

Normality of Acetic Acid.	Gms. $\text{CH}_3\text{COOH}$ per 100 cc. Sol.	Residue from 50.052 cc. Sol.	Normality of Acetic Acid.	Gms. $\text{CH}_3\text{COOH}$ per 100 cc. Sol.	Residue from 50.052 cc. Sol.
0	0	0.0217	3.80	22.80	0.2042
0.57	3.42	0.1082	5.70	34.20	0.1844
1.425	8.55	0.1635	10.09	60.54	0.1160
2.85	17.10	0.1970	16.505	93.03	0.0337

The residue was dried at 70° C.

**CALCIUM BITARTRATE**  $\text{CaH}_2(\text{C}_4\text{H}_4\text{O}_6)_2$ .

SOLUBILITY IN WATER AND IN AQUEOUS SOLUTIONS OF ACIDS AND OF SALTS.

(Warrington — J. Chem. Soc. 28, 946, '75.)

In Hydrochloric Acid.

In other Acids and in Salt Solutions at 14°.

Conc. of HCl Gms. per 100 Gms. Sol.	Gms. $\text{CaH}_2(\text{C}_4\text{H}_4\text{O}_6)_2$ per 100 Gms. Solvent.		Acid or Salt.	Gms. Acid or Salt per 100 cc. Sol.	Gms. $\text{CaH}_2(\text{C}_4\text{H}_4\text{O}_6)_2$ per 100 cc. Sol.
	At 22°.	At 80°.			
0	0.600	4.027	Acetic Acid	0.81	0.422
0.68	3.01	5.35	Tartaric Acid	1.03	0.322
2.15	6.88	11.35	Citric Acid	0.84	0.546
4.26	11.19	20.23	Sulphuric Acid	0.685	1.701
8.36	22.75	40.93	Hydrochloric Acid	0.504	1.947
16.13	48.31	80.12	Nitric Acid	0.845	1.969
			Potassium Acetate	1.387	0.744
			Potassium Citrate	1.397	0.843

100 gms.  $\text{H}_2\text{O}$  dissolve 0.422 gms. bitartrate at 14°

## SOLUBILITY IN AQUEOUS SOLUTIONS OF SALTS.

(Mackenzie — Wied. Ann. Physik. [2] 1, 450, '77.)

Salt in Solution.	Gms. Salt per 100 Gms. Solution.	Density of Solution 15°.	Absorption Coefficient $\alpha$ at:			
			8°.	15°.	22°.	
KCl	6.05	1.021	0.988	0.777	0.670	
"	8.646	1.053	0.918	0.777	0.649	
"	11.974	1.080	0.864	0.720	0.597	
"	22.506	1.549	0.688	0.571	0.480	
NaCl	7.062	1.038	0.899 (6.4°)	0.735	...	
"	12.995	1.080	0.633 (6.4°)	0.557	0.482	
"	17.42	1.123	0.518 (6.4°)	0.431	0.389	
"	26.00	1.195	0.347 (6.4°)	0.297	0.263	
NH <sub>4</sub> Cl	6.465	1.021	1.023	0.825	0.718	
"	8.723	1.047	1.000	0.791	0.702	
"	12.727	1.053	0.922	0.798	0.684	
"	24.233	1.072	0.813 (10°)	0.738	0.600	
			8°.	16.5°.	22°.	30°.
BaCl <sub>2</sub>	7.316	1.068	0.969	0.744	0.680	0.566
"	9.753	1.092	1.021	0.645	0.607	0.543
"	14.030	1.137	...	0.618	0.524	0.467
"	25.215	1.273	0.495	0.618	0.383	0.315
SrCl <sub>2</sub>	9.511	1.087	0.779	0.663	0.581	0.508
"	12.325	1.1159	0.737	0.586	0.507	0.539
"	17.713	1.173	0.606	0.473	0.444	0.367
"	31.194	1.343	0.285	0.245	0.247	0.223
CaCl <sub>2</sub>	4.365	1.036	0.942	0.759	0.673	0.596
"	5.739	1.049	0.855	0.726	0.616	0.527
"	8.045	1.068	0.838	0.674	0.581	0.500
"	15.793	1.139	0.632	0.520	0.471	0.400

## SOLUBILITY OF CARBON DIOXIDE IN ALCOHOL.

(Bohr — Wied. Ann. Physik [4] 1, 247, '00.)

t°.	In 99 per cent Alcohol.		In 98.7 per cent Alcohol.	
	cc. CO <sub>2</sub> (at 0° and 760 mm.) per 1 cc. Alcohol.	Sat. Solution.	cc. CO <sub>2</sub> (at 0° and 760 mm.) per 1 cc. Alcohol.	Sat. Solution.
-65	38.41	35.93	39.89	37.22
-20	7.51	7.41	7.25	7.16
-10	5.75	5.69	5.43	5.38
0	4.44	4.40	4.35	4.31
+10	3.57	3.55	...	...
20	2.98	2.96	...	...
25	2.76	2.74	...	...
30	2.57	2.56	...	...
40	2.20	2.19	...	...
45	2.01	2.00	...	...

## SOLUBILITY IN AQUEOUS ALCOHOL AT 20°.

(Müller — Wied. Ann. Physik. [2] 37, 39, '89; Lubarsch — *Ibid.* [2] 37, 525, '89.)

Density of Alcohol.	Per cent Alcohol By Wt.	Abs. Coef. of CO <sub>2</sub> , a.	Density of Alcohol.	Per cent Alcohol By Wt.	Abs. Coef. of CO <sub>2</sub> , a.
0.998	1.07	0.861	0.922	49.0	0.982
0.969	22.76	0.841	0.870 (18.8°)	71.1	1.293
0.960 (22.4°)	28.46	0.792	0.835 (16°)	85.3	1.974
0.956	31.17	0.801	0.795 (19°)	99.7	2.719
0.935 (17°)	42.15	0.877			

## SOLUBILITY OF CARBON DIOXIDE IN ORGANIC SOLVENTS.

(Just — Z. physik. Chem. 37, 354, '01.)

Solvent.	Sol. of CO <sub>2</sub> , Ostwald Expression.*			Solvent.	Sol. of CO <sub>2</sub> , Ostwald Expression.*		
	<i>l</i> <sub>25</sub> .	<i>l</i> <sub>30</sub> .	<i>l</i> <sub>35</sub> .		<i>l</i> <sub>25</sub> .	<i>l</i> <sub>30</sub> .	<i>l</i> <sub>35</sub> .
CS <sub>2</sub>	0.870	0.889	0.945	C <sub>2</sub> H <sub>5</sub> OH	2.498	...	...
C <sub>2</sub> H <sub>5</sub> NH <sub>2</sub>	1.324	1.434	1.531	C <sub>2</sub> H <sub>5</sub> OH(95%)	2.706	2.923	3.130
C <sub>2</sub> H <sub>5</sub> OH	1.831	1.941	2.058	C <sub>2</sub> H <sub>5</sub> COH	2.841	3.057	3.304
C <sub>2</sub> H <sub>5</sub> Br	1.842	1.964	2.092	CHCl <sub>3</sub>	3.430	3.681	3.958
CCl <sub>4</sub>	2.294	2.502	2.603	CH <sub>3</sub> OH	3.837	4.205	4.606
C <sub>2</sub> H <sub>5</sub> CH <sub>3</sub>	2.305	2.426	2.557	CH <sub>3</sub> COOH	4.691	5.129	5.614
C <sub>2</sub> H <sub>4</sub>	2.425	2.540	2.716	(CH <sub>3</sub> CO) <sub>2</sub> O	5.206	5.720	6.18
C <sub>2</sub> H <sub>5</sub> NO <sub>2</sub>	2.456	2.655	2.845	(CH <sub>3</sub> ) <sub>2</sub> CO	6.295	6.921	...

\* See p. 105.

Determinations are also given for the solubility in glycerine, iod benzene, *o* and *m* toluidine, eugenol, benzene tri chloride, cumol, carvene, di chlor hydrine, iso butyl alcohol, benzyl chloride, meta xylol, ethylene bromide, chlor benzene, propylene bromide, amyl bromide, carvol, amyl chloride, iso butyl chloride, butyric acid, ethylene chloride, pyridine, amyl formate, propionic acid, amyl acetate, iso butyl acetate, and in methyl acetate.

See Woukoloff — Compt. rend. 108, 674; 109, 62, '89, for the solubility of CO, in CS<sub>2</sub>, and CHCl<sub>3</sub>, at different pressures.

## CARBON MONOXIDE CO.

## SOLUBILITY IN WATER.

(Winkler — Ber. 34, 1416, '01.)

t°.	β, "Absorp. Coef."	β', "Solu-bility."	q.	t°.	β, "Absorp. Coef."	β', "Solu-bility."	q.
0	0.03537	0.03516	0.0044	40	0.01775	0.01647	0.0021
5	0.03149	0.03122	0.0039	50	0.01615	0.01420	0.0018
10	0.02816	0.02782	0.0035	60	0.01488	0.01197	0.0015
15	0.02543	0.02501	0.0031	70	0.01440	0.00998	0.0013
20	0.02319	0.02266	0.0028	80	0.01430	0.00762	0.0010
25	0.02142	0.02076	0.0026	90	0.01420	0.00438	0.0006
30	0.01998	0.01915	0.0024	100	0.01410	0.00000	0.0000

β = vol. of CO absorbed by 1 volume of the liquid at a partial pressure of 760 mm. See page 105.

β' = vol. of CO (reduced to 0° and 760 mm.) absorbed by 1 volume of the liquid under a total pressure of 760 mm.

q = grams of CO dissolved by 100 grams H<sub>2</sub>O at a total pressure of 760 mm.

# CARBON MONOXIDE

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## SOLUBILITY OF CARBON MONOXIDE IN AQUEOUS ALCOHOL SOLUTIONS AT 20° AND 760 MM. PRESSURE.

(Lubarsch — Wied. Annalen Physik. [2] 37, 525, '89.)

Wt. % Alcohol.	Vol. % Absorbed CO.	Wt. % Alcohol.	Vol. % Absorbed CO.
0.00	2.41	28.57	1.50
9.09	1.87	33.33	1.94
16.67	1.75	50.00	3.20
23.08	1.68		

## SOLUBILITY OF CARBON MONOXIDE IN ORGANIC SOLVENTS.

(Just — Z. physik. Chem. 37, 361, '01.)

Results in terms of the Ostwald Solubility Expression, see p. 105.

Solvent.	$l_{25}$ .	$l_{20}$ .	Solvent.	$l_{25}$ .	$l_{20}$ .
Water	0.02404	0.02586	Toluene	0.1808	0.1742
Anilin	0.05358	0.05055	Ethyl Alcohol	0.1921	0.1901
Carbon Disulphide	0.08314	0.08112	Chloroform	0.1954	0.1897
Nitro Benzene	0.09366	0.09105	Methyl Alcohol	0.1955	0.1830
Benzene	0.1707	0.1645	Amylacetate	0.2140	0.2108
Acetic Acid	0.1714	0.1689	Acetone	0.2225	0.2128
Amyl Alcohol	0.1714	0.1706	Iso Butyl Acetate	0.2365	0.2314
Xylene	0.1781	0.1744	Ethyl Acetate	0.2516	0.2419

100 volumes of petroleum absorb 12.3 vols. CO at 20°, and 13.4 vols. at 10°.

(Guiewasz and Walfisz — Z. physik. Chem. 1, 70, '87.)

## SOLUBILITY OF CARBON MONOXIDE IN MIXTURES OF ACETIC ACID AND OTHER SOLVENTS AT 25°.

(Skirrow — Z. physik. Chem. 41, 148, '02.)

Results in terms of the Ostwald Solubility Expression, see p. 105.

Mixture of Acetic Ac. and:	% CH <sub>3</sub> COOH in Mixture.		CO. $l_{25}$ .	Mixture of Acetic Ac. and:	% CH <sub>3</sub> COOH in Mixture.		CO. $l_{25}$ .
	By Wt.	By Vol.			By Wt.	By Vol.	
Anilin	100.0	100.0	0.173	Chloroform	56.4	64.5	0.196
"	86.5	90.8	0.110	"	0.0	0.0	0.206
"	58.3	68.5	0.070	Nitro Benzene	88.4	84.8	0.156
"	13.8	25.1	0.058	"	49.0	66.3	0.130
"	0.0	0.0	0.053	"	0.0	0.0	0.093
Benzene	67.5	63.4	0.199	Toluene	74.7	71.0	0.191
"	33.6	29.6	0.198	"	56.9	52.6	0.195
"	19.2	16.5	0.190	"	20.5	17.8	0.190
"	0.0	0.0	0.174	"	0.0	0.0	0.182

### SOLUBILITY OF CARBON MONOXIDE IN MIXTURES OF ACETONE AND OTHER SOLVENTS AT 25°.

(Skirrow.)

Mixture of Acetone and:	% (CH <sub>3</sub> ) <sub>2</sub> CO in Mixture.		CO. l <sub>25</sub> .	Mixture of Acetone and:	% (CH <sub>3</sub> ) <sub>2</sub> CO in Mixture.		CO. l <sub>25</sub> .
	By Wt.	By Vol.			By Wt.	By Vol.	
Anilin	100.0	100.0	0.238	Chloroform	66.6	78.9	0.226
"	79.2	85.9	0.179	"	26.5	40.4	0.212
"	44.9	56.7	0.110	"	0.0	0.0	0.207
"	0.0	0.0	0.053	β Naphthol	86.0	93.9	0.190
Carbon Bisulphide	82.0	83.8	0.236	"	73.1	87.1	0.169
"	50.5	61.8	0.227	Nitro Benzene	78.4	88.5	0.207
"	26.0	35.7	0.187	"	46.8	69.5	0.157
"	14.5	21.2	0.144	"	0.0	0.0	0.090
"	0.0	0.0	0.096	Phenanthrene	87.2	95.4	0.205
Naphthalene	86.7	93.5	0.199	"	75.0	90.2	0.183
"	72.6	85.4	0.187				

### SOLUBILITY OF CARBON MONOXIDE IN MIXTURES OF BENZENE AND OTHER SOLVENTS AT 25°.

(Skirrow — Z. physik. Chem. 41, 144, '02.)

The solubility of the CO given in terms of the Ostwald Expression, see p. 105.

Mixture of Benzene and:	% C <sub>6</sub> H <sub>6</sub> in Mixture.		CO. l <sub>25</sub> .	Mixture of Benzene and:	% C <sub>6</sub> H <sub>6</sub> in Mixture.		CO. l <sub>25</sub> .
	By Wt.	By Vol.			By Wt.	By Vol.	
Naphthalene	100.0	100.0	0.174	Anilin	87.3	89.1	0.156
"	88.5	92.6	0.164	"	71.7	75.2	0.131
"	66.2	76.3	0.141	"	42.6	47.0	0.095
Phenanthrene	89.2	95.1	0.144	"	21.2	24.3	0.068
"	72.6	85.8	0.127	"	0.0	0.0	0.053
α Naphthalene	96.5	98.1	0.149	Nitro Benzene	71.8	80.1	0.152
"	87.9	93.1	0.139	"	45.1	56.4	0.127
Ethyl Alcohol	47.7	44.9	0.181	"	0.0	0.0	0.093
"	0.0	0.0	0.192				

### SOLUBILITY OF CARBON MONOXIDE IN MIXTURES OF TOLUENE AND OTHER SOLVENTS AT 25°.

(Skirrow.)

Mixture of Toluene and:	% C <sub>6</sub> H <sub>5</sub> CH <sub>3</sub> in Mixture.		CO. l <sub>25</sub> .	Mixture of Toluene and:	% C <sub>6</sub> H <sub>5</sub> CH <sub>3</sub> in Mixture.		CO. l <sub>25</sub> .
	By Wt.	By Vol.			By Wt.	By Vol.	
Anilin	100.0	100.0	0.182	α Naphthol	95.5	97.1	0.171
"	94.4	93.5	0.169	"	91.2	94.2	0.162
"	80.1	80.3	0.148	Nitro Benzene	81.7	85.7	0.160
"	55.4	55.6	0.115	"	50.8	58.1	0.131
"	25.4	25.6	0.077	"	23.7	29.3	0.108
"	0.0	0.0	0.053	"	0.0	0.0	0.093
Naphthalene	92.9	94.8	0.169	Phenanthrene	94.4	97.0	0.170
"	84.9	88.7	0.161	"	88.8	93.9	0.161
"	77.3	82.5	0.153	"	78.4	87.5	0.147



# CARBON MONOXIDE

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## SOLUBILITY OF CARBON MONOXIDE IN MIXTURES OF ORGANIC SOLVENTS AT 25°.

(Skirrow.)

Mixture Composed of:	% of Latter in Mixture.		CO. lbs.
	By Wt.	By Vol.	
Chloroform and Methyl Alcohol	0.0		0.207
" "	13.0		0.202
" "	100		0.196
Carbon Bisulphide and Ethyl Di Chloride		100	0.147
" "		75	0.157
" "		51	0.160
" "		18.4	0.140
" "		0.0	0.083
Methyl Alcohol and Glycerine	0.0	0.0	0.196
" "	39.6	30.1	0.096
" "	60.5	50.1	0.052
" "	77.1	68.9	0.025
" "	100.0	100.0	very small

NOTE. — From the results shown in the preceding five tables, it is concluded that the solubility of carbon monoxide in various mixtures of organic solvents is, in general, an additive function.

# CARBON BISULPHIDE CS<sub>2</sub>.

## SOLUBILITY IN WATER.

(Chancel and Parmentier — Compt. rend. 100, 773, 85; Rex — Z. physik. Chem. 55, 355, '06.)

t°.	Grams CS <sub>2</sub> per 100		t°.	Grams CS <sub>2</sub> per 100	
	cc. Solu- tion.	Gms. H <sub>2</sub> O (Rex).		cc. Solu- tion.	Gms. H <sub>2</sub> O (Rex).
0	0.204	0.258	30	0.155	0.195
5	0.199	...	35	0.137	...
10	0.194	0.239	40	0.111	...
15	0.187	...	45	0.070	...
20	0.179	0.101	49	0.014	...
25	0.169	...			

100 cc. H<sub>2</sub>O dissolve 0.174 cc. CS<sub>2</sub> at 22°; Vol. of solution = 100.208, Sp. Gr. = 0.9981.

100 cc. CS<sub>2</sub> dissolve 0.961 cc. H<sub>2</sub>O at 22°; Vol. of solution = 100.961, Sp. Gr. = 1.253. (Herz — Ber. 31, 2670, '98.)

## SOLUBILITY OF CARBON BISULPHIDE IN:

### Aq. Solutions of Ethyl Alcohol at 17°.

(Tuchschmidt and Folluins — Ber. 4, 583, '71.)

### Methyl Alcohol.

(Rothmund — Z. physik. Chem. 26, 475, '98.)

Wt. per cent Alcohol.	Gms. CS <sub>2</sub> per 100 cc. Solvent.	Wt. per cent Alcohol.	Gms. CS <sub>2</sub> per 100 cc. Solvent.	t°.	Wt. per cent CS <sub>2</sub> in:	
					CH <sub>3</sub> OH Layer.	CS <sub>2</sub> Layer.
100	∞	91.37	50	10	45.1	98.3
98.5	182	84.12	30	20	50.8	97.2
98.15	132	76.02	20	25	54.2	96.4
96.95	100	48.40	2	30	58.4	95.5
93.54	70	47.90	0	35	64.0	93.5
				40.5 (crit. temp.)	80.5	

## SOLUBILITY OF CARBON OXYSULPHIDE IN WATER.

(Winkler; see Landolt and Börnstein's Tabellen, 3d ed. p. 602, 1906.)

t°.	$\beta$ .	$\gamma$ .	t°.	$\beta$ .	$\gamma$ .
0	1.333	0.356	20	0.561	0.147
5	1.056	0.281	25	0.468	0.122
10	0.835	0.221	30	0.403	0.104
15	0.677	0.179			

For  $\beta$  and  $\gamma$  see Carbon Dioxide, page 105.**CARBON TETRACHLORIDE.** See p. 201.**CARVOXIME**  $C_{10}H_4:NOH$ .SOLUBILITY IN  $r$  LIMONENE.

(Goldschmidt and Cooper — Z. physik. Chem. 26, 714, '98.)

t°.	Gms. $C_{10}H_4:NOH$ per 100 Gms. $r$ Limonene.	Solid Phase.	t°.	Gms. $C_{10}H_4:NOH$ per 100 Gms. $r$ Limonene.	Solid Phase.
24.6	44.6	<i>l</i> Carvoxime	48	198.7	<i>l</i> Carvoxime
30.0	59.2	<i>l</i> Carvoxime	49.4	199.7	<i>r</i> Carvoxime
30.3	63.3	<i>r</i> Carvoxime	55.4	325.1	<i>l</i> Carvoxime
38.4	104.3	<i>l</i> Carvoxime	55.9	346.6	<i>r</i> Carvoxime
39.4	103.1	<i>r</i> Carvoxime	58.8	560.0	<i>r</i> Carvoxime
43.1	130.8	<i>l</i> Carvoxime	63.2	126.93	<i>r</i> Carvoxime

**CERIUM ACETATE, BUTYRATE, FORMATE, etc.**

## SOLUBILITY IN WATER.

(Wolff — Z. anorg. Chem. 45, 102, '05.)

Salt.	Formula.	Grams Anhydrous Salt per 100 Gms. Solution at:		
		11°.	15°.	76°.
Acetate	$Ce(C_2H_3O_2)_3 \cdot 1\frac{1}{2}H_2O$	...	19.61	12.97
Butyrate	$Ce(C_4H_7O_2)_3$ , and $3H_2O$	3.544	3.406	1.984
Iso Butyrate	$Ce(C_4H_7O_2)_3 \cdot 3H_2O$	...	6.603 (20.4°)	3.39
Formate	$Ce(CHO_2)_3$	...	0.398 (13°)	0.374 (75.3°)
Propionate	$Ce(C_3H_5O_2)_3 \cdot H_2O$ , and $3H_2O$	...	18.99	15.93

**CERIUM AMMONIUM NITRATE** (Ceri)  $Ce(NO_3)_4 \cdot 2NH_4NO_3$ .

## SOLUBILITY IN WATER.

(Wolff.)

t°.	Gms. per 100 Gms. Solution.		Atomic Relation.	Gms. $Ce(NO_3)_4 \cdot 2NH_4NO_3$ per 100 Gms.	
	$NH_4$ .	Ce.		Solution.	Water.
25	4.065	15.16	2.08 : 1	58.49	140.9
35.2	4.273	16.10	2.06 : 1	61.79	161.7
45.3	4.489	16.69	2.08 : 1	64.51	174.9
64.5	4.625	{ 17.40 Ce 15.03 Ce IV	2.06 : 1 Ce 2.39 : 1 Ce IV	66.84	201.6
85.6	4.778	{ 18.16 Ce 15.79 Ce IV	2.04 : 1 Ce 2.34 : 1 Ce IV	69.40	226.8
112	6.117	{ 22.82 Ce 16.22 Ce IV	2.08 : 1 Ce 2.95 : 1 Ce IV	88.03	735.4

# CERIUM AMMONIUM NITRATE 112

CERIUM AMMONIUM NITRATE (Cero)  $\text{Ce}(\text{NO}_3)_3 \cdot 2\text{NH}_4\text{NO}_3 \cdot 4\text{H}_2\text{O}$ .

## SOLUBILITY IN WATER.

(Wolff.)

t°.	Gms. per 100 Gms. Solution.		Atomic Relation. NH <sub>4</sub> : Ce.	Gms. $\text{Ce}(\text{NO}_3)_3 \cdot 2\text{NH}_4\text{NO}_3$ per 100 Gms.	
	NH <sub>4</sub> .	Ce.		Solution.	Water.
8.75	4.787	18.56	1.999 : 1	70.2	235.5
25.0	5.09	19.80	1.995 : 1	74.8	296.8
45.0	5.53	21.06	2.037 : 1	80.4	410.2
60.0	6.01	22.77	2.054 : 1	87.2	681.2
65.06	6.11	23.42	2.022 : 1	89.1	817.4

# CERIUM AMMONIUM SULPHATE $\text{Ce}_2(\text{SO}_4)_3 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 8\text{H}_2\text{O}$ .

## SOLUBILITY IN WATER.

(Wolff.)

t°.	Gms. $\text{Ce}_2(\text{SO}_4)_3 \cdot (\text{NH}_4)_2\text{SO}_4$ per 100 Gms. Solution.		Solid Phase.	t°.	Gms. $\text{Ce}_2(\text{SO}_4)_3 \cdot (\text{NH}_4)_2\text{SO}_4$ per 100 Gms. Solution.		Solid Phase.
	Solution.	Water.			Solution.	Water.	
22.3	5.06	5.33	.8H <sub>2</sub> O	45.0	2.91	2.99	Anhydride
35.1	4.93	5.18	"	55.25	2.16	2.21	"
45.2	4.76	4.99	"	75.4	1.46	1.48	"
				85.2	1.17	1.18	"

# CERIUM SULPHATE $\text{Ce}_2(\text{SO}_4)_3$ .

## SOLUBILITY OF THE SEVERAL HYDRATES IN WATER.

(Koppel — Z. anorg. Chem. 41, 377, '04; the previous determinations by Muthman and Rolig — Z. anorg. Chem. 16, 455, '98, and by Wyruboff — Bull. soc. chim. [3] 25, 121, '01, are shown by Koppel to be inaccurate.)

t°.	Gms. $\text{Ce}_2(\text{SO}_4)_3$ per 100 Gms. Solution.		Mols. $\text{Ce}_2(\text{SO}_4)_3$ per 100 Mols. H <sub>2</sub> O.	Solid Phase.	t°.	Gms. $\text{Ce}_2(\text{SO}_4)_3$ per 100 Gms. Solution.		Mols. $\text{Ce}_2(\text{SO}_4)_3$ per 100 Mols. H <sub>2</sub> O.	Solid Phase.
	Solution.					Solution.			
0	14.20	0.525	$\text{Ce}_2(\text{SO}_4)_3 \cdot 12\text{H}_2\text{O}$		20.5	8.69	0.302	$\text{Ce}_2(\text{SO}_4)_3 \cdot 8\text{H}_2\text{O}$	
18.8	14.91	0.555	"		40	5.613	0.188	"	
19.2	15.04	0.561	"		60	3.88	0.129	"	
0	17.35	0.665	$\text{Ce}_2(\text{SO}_4)_3 \cdot 9\text{H}_2\text{O}$		45	8.116	0.280	$\text{Ce}_2(\text{SO}_4)_3 \cdot 5\text{H}_2\text{O}$	
15	10.61	0.376	"		60	3.145	0.103	"	
21	8.863	0.308	"		80	1.19	0.0382	"	
31.6	6.686	0.227	"		100.5	0.46	0.0149	"	
45.6	4.910	0.164	"		35	7.8	0.27	$\text{Ce}_2(\text{SO}_4)_3 \cdot 4\text{H}_2\text{O}$	
50	4.465	0.148	"		40	5.71	0.19	"	
60	3.73	0.123	"		50	3.31	0.11	"	
65	3.47	0.114	"		65	1.85	0.06	"	
0	15.95	0.605	$\text{Ce}_2(\text{SO}_4)_3 \cdot 8\text{H}_2\text{O}$		82	0.98	0.032	"	
15	9.95	0.350	"		100.5	0.42	0.014	"	

CHLORAL HYDRATE  $C_2HCl_3.O.H_2O$ .SOLUBILITY IN WATER, ETHYL ALCOHOL, CHLOROFORM, AND IN  
TOLUENE.

(Speyers — Am. J. Sci. [4] 14, 294, '02.)

Calculated from the original results, which are given in terms of  
gram molecules of chloral hydrate per 100 gram mols. of solvent.

t°.	In Water.		In Alcohol.		In Chloroform.		In Toluene.	
	W.	S.	W.	S.	W.	S.	W.	S.
0	1.433	189.7	1.11	123.3	1.530	3.7	0.898	3.2
5	1.460	233.0	1.16	130.0	1.515	4.0	0.900	4.0
10	1.485	275.0	1.23	140.0	1.510	5.0	0.910	7.0
15	1.510	330.0	1.30	160.0	1.505	9.0	0.915	11.0
20	1.535	383.0	1.36	185.0	1.510	19.0	0.94	21.0
25	1.555	433.0	1.42	215.0	1.520	34.0	0.97	36.0
30	1.580	480.0	1.49	245.0	1.540	56.0	1.02	56.0
35	1.59	516.0	1.55	280.0	1.570	80.0	1.13	80.0
40	1.605	...	1.60	320.0	1.590	110.0	1.40	110.0
45	1.620	...	...	...	...	...	...	...

W = wt. of 1 cc. saturated solution, S = Gms.  $C_2HCl_3.H_2O$  per 100  
grams solvent.

## CHLORINE Cl.

## SOLUBILITY IN WATER.

(Winkler — Landolt and Börnstein's Tabellen, 3d ed. p. 532, 601, '06; Roozeboom — Rec. trav. chim.  
3, 59, '84; 4, 69, '85; Z. physik. Chem. 2, 452, '88.)

t°.	$\beta'$ .	q.	t°.	Gms. Cl per 100 Gms. $H_2O$ .	Solid Phase.
0	4.610	1.46	-0.24	0.492	Ice + Cl.8 aq.
3	3.947	1.25	0	0.507-0.560	Cl.8 aq.
6	3.411	1.08	2	0.644	"
9	3.031	0.96	4	0.732	"
9.6	2.980	0.94	6	0.823	"
12.0	2.778	0.88	8	0.917	"
10	3.095	0.997	9	0.965-0.908	"
15	2.635	0.849	20	1.85	"
20	2.260	0.729	28.7	3.69	"
25	1.985	0.641			
30	1.769	0.572			
40	1.414	0.459			
50	1.204	0.393			
60	1.006	0.329			
70	0.848	0.279			
80	0.672	0.223			
90	0.380	0.127			
100	0.000	0.000			

 $\beta'$  = vol. of Cl (red. to 0° and 760 mm.) absorbed by 1 vol.  $H_2O$  at  
total pressure of 760 mm.q = Gms. Cl per 100 gms.  $H_2O$  at a total pressure of 760 mm.

# CHLORINE

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## SOLUBILITY IN WATER.

(Goodwin — Ber. 15, 3039, '82.)

The saturated aqueous solution of the chlorine was cooled until chlorhydrate separated; the temperature was then gradually raised and portions withdrawn for analysis at intervals. Slightly different results were obtained for solutions in contact with much, little, or no chlorhydrate. The following results are taken from an average curve.

t°.	Solubility Coefficient.	t°.	Solubility Coefficient.	t°.	Solubility Coefficient.
2.5	1.76	11	3.0	25	2.06
5.0	2.00	12.5	2.75	30	1.8
7.5	2.25	15	2.6	40	1.35
10	2.7	20	2.3	50	1.0

## SOLUBILITY OF CHLORINE IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID AND OF POTASSIUM CHLORIDE.

(Goodwin.)

t°.	Coefficient of Solubility in:			
	HCl (1.046 Sp. Gr.).	HCl (1.08 Sp. Gr.).	HCl (1.125 Sp. Gr.).	KCl (20 g. per 100 cc.).
0	4.1	6.4	7.3	1.5
5	5.1	5.2	6.7	2.0
10	4.1	4.5	6.1	2.2
15	3.5	3.9	5.5	1.6
20	3.0	3.4	4.7	1.2
25	2.5	3.0	4.0	1.0
30	2.0	2.4	...	0.9
40	1.25	1.6	...	...

Goodwin also gives results for solutions of NaCl, CaCl<sub>2</sub>, MgCl<sub>2</sub>, SrCl<sub>2</sub>, Fe<sub>2</sub>Cl<sub>3</sub>, CoCl<sub>2</sub>, NiCl<sub>2</sub>, MnCl<sub>2</sub>, CdCl<sub>2</sub>, LiCl, and in mixtures of some of these, but the concentrations of the salt solutions are not stated.

## SOLUBILITY OF CHLORINE IN AQUEOUS SOLUTIONS OF SODIUM CHLORIDE.

(Kumpf — Wied. Ann. Beibl. 6, 276, '82; Kohn and O'Brien — J. Soc. Chem. Ind. 17, 100, '98.)

t°.	Coefficient of Solubility in:			
	9.97% NaCl.	16.01% NaCl.	19.66% NaCl.	26.39% NaCl.
0	2.3	1.9	1.7	0.5
5	2.0	1.6	1.4	0.44
10	1.7	1.3	1.15	0.4
15	1.4	1.06	0.95	0.36
20	1.2	0.9	0.8	0.34
25	0.94	0.75	0.65	0.3
50	...	...	...	0.2
80	...	...	...	0.05

100 cc. of 6.2 per cent CaCl<sub>2</sub> solution dissolve 0.245 gram Cl at 12°.  
 100 cc. of 6.2 per cent MgCl<sub>2</sub> solution dissolve 0.233 gram Cl at 12°.  
 100 cc. of 6.2 per cent MnCl<sub>2</sub> solution dissolve 0.200 gram Cl at 12°.

For coefficient of solubility see page 105.

**CHLORINE MONOXIDE  $\text{Cl}_2\text{O}$ .**

100 volumes of water at  $0^\circ$  absorb 200 volumes of  $\text{Cl}_2\text{O}$  gas.

**CHLORINE TRIOXIDE  $\text{Cl}_2\text{O}_3$ .**

SOLUBILITY IN WATER AT APPROX. 760 MM. PRESSURE.

(Brandan — Liebig's Ann. 151, 340, '69.)

$t^\circ$ .	$8.5^\circ$ .	$14.0^\circ$ .	$21^\circ$ .	$93^\circ$ .
Gms. $\text{Cl}_2\text{O}_3$ per 100 gms. $\text{H}_2\text{O}$	4.765	5.012	5.445	5.651

Garzarolli and Thurnbalk — Liebig's Ann. 209, 184, '81, say that  $\text{Cl}_2\text{O}_3$  does not exist, and above figures are for mixtures of  $\text{Cl}_2\text{O}$  and  $\text{Cl}$ .

**CHLOROFORM  $\text{CHCl}_3$ .**

SOLUBILITY IN WATER.

(Chancel and Parmentier — Compt. rend. 100, 473, 85; Rex — Z. physik. Chem. 55, 355, '06.)

$t^\circ$ .	Gms. $\text{CHCl}_3$ per Liter of Solution.	Density of Solutions.	$t^\circ$ .	Gms. $\text{CHCl}_3$ per 100 Gms. $\text{H}_2\text{O}$ (Rex).
0	9.87	1.00378	0	1.062
3.2	8.90	...	10	0.895
17.4	7.12	1.00284	20	0.822
29.4	7.05	1.00280	30	0.776
41.6	7.12	1.00284		
54.9	7.75	1.00309		

100 cc.  $\text{H}_2\text{O}$  dissolve 0.42 cc.  $\text{CHCl}_3$  at  $22^\circ$ ; Vol. of sol. = 100.39 cc., Sp. Gr. = 1.0002.

100 cc.  $\text{CHCl}_3$  dissolve 0.152 cc.  $\text{H}_2\text{O}$  at  $22^\circ$ ; Vol. of sol. = 99.62 cc., Sp. Gr. = 1.4831.

(Herz — Ber. 31, 2670, '98.)

**SOLUBILITY OF CHLOROFORM IN AQUEOUS ETHYL ALCOHOL, METHYL ALCOHOL, AND ACETONE MIXTURES AT  $20^\circ$ .**

(Bancroft — Phys. Rev. 3, 29, '95, '96.)

In Ethyl Alcohol.

In Methyl Alcohol.

In Acetone.

Per 5 cc. $\text{C}_2\text{H}_5\text{OH}$ .		Per 5 cc. $\text{CH}_3\text{OH}$ .		Per 5 cc. $(\text{CH}_3)_2\text{CO}$	
cc. $\text{H}_2\text{O}$ .	cc. $\text{CHCl}_3$ .	cc. $\text{H}_2\text{O}$ .	cc. $\text{CHCl}_3$ .	cc. $\text{H}_2\text{O}$ .	cc. $\text{CHCl}_3$ .
10	0.20	10	0.10	5.0	0.16
8	0.3	5	0.48	4.0	0.22
6	0.515	4	0.80	3.0	0.33
4	1.13	2	4.0	2.0	0.58
2	2.51	1.49	7.0	1.0	0.955
1	4.60	1.35	8.0	0.79	1.12
0.91	5.0	1.12	10.0	0.505	1.60
0.76	6.0			0.30	2.50
0.55	8.0			0.21	3.50
0.425	10.0			0.19	4.0
0.20	20.0			0.16	5.0
0.125	30.24			0.12	10.0

## CHROMIUM ALUMS

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### SOLUBILITY OF CHROMIUM ALUMS IN WATER AT 25°.

(Locke — Am. Ch. J. 26, 174, '01.)

Alum	Formula.	Per 100 cc. Water.		
		Grams Anhydrous.	Grams Hydrated.	Gram Mols.
Potassium Chromium Alum	$K_2Cr_2(SO_4)_4 \cdot 24H_2O$	12.51	24.39	0.0441
Tellurium Chromium Alum	$Te_2Cr_2(SO_4)_4 \cdot 24H_2O$	10.41	16.38	0.0212

## CHROMIUM CHLORIDE (ic) $CrCl_3 \cdot 6\frac{1}{2}H_2O$ .

100 grams  $H_2O$  dissolve 130 grams (green modification) at 15°.

(Recoura — Compt. rend. 102, 518, '86.)

## CHROMIUM DOUBLE SALTS.

### SOLUBILITY IN WATER.

(Jørgensen — J. pr. Chem. [2] 20, 105, '79; [2] 30, 1, '84; [2] 42, 208, '90; Struve — *Ibid.* [2] 61, 457, '99.)

Name of Salt.	Formula.	t°.	Gms. per 100 Gms. $H_2O$ .
Chloro Tetra Amine Chromium Chloride	$CrCl(NH_3)_4(OH)_2Cl_2$	15	6.3
Chloro Purpureo Chromium Chloride	$CrCl(NH_3)_4Cl_2$	16	0.65
Luteo Chromium Nitrate	$Cr(NH_3)_4(NO_3)_3$	?	2.6
Chloro Purpureo Chromium Nitrate	$CrCl(NH_3)_4(NO_3)_3$	17.5	1.4
Chromic Potassium Molybdate	$3K_2O \cdot Cr_2O_3 \cdot 12MoO_3 \cdot 20H_2O$	17	2.5

## CHROMIUM TRIOXIDE $CrO_3$ .

### SOLUBILITY IN WATER.

(Mylius and Funk — Wiss. Abh. p. t. Reichanstalt, 3, 451, '00.)

t°.	Gms. $CrO_3$ per 100 g. Solution.	Mols. $CrO_3$ per 100 Mols. $H_2O$ .	Solid Phase.
0	62.08	29.4	$CrO_3$
15	62.38	29.8	"
18	62.45	29.91	"
50	64.55	32.7	"
99	67.39	37.1	"

Density of solution saturated at 18° = 1.705.

## CHROMIUM SULPHATES (ous and ic).

### SOLUBILITY IN WATER (ous at 0°).

Salt.	Gms. per 100 Gms. $H_2O$ .	Solid Phase.	Authority.
Chromous	12.35	$CrSO_4 \cdot 7H_2O$	(Moissan — Bull. soc. chim. [2] 37, 296, '82)
Chromic	120.0	$Cr_2(SO_4)_3 \cdot 18H_2O$	(Etard — Compt. rend. 84, 1090, '77.)

## CHRYSAROBIN $C_{20}H_{26}O_7$ .

### SOLUBILITY IN SEVERAL SOLVENTS.

(U. S. P.)

Solvent.	Gms. per 100 $H_2O$ at 25°.	Gms. Solvent at 80°.	Solvent.	Gms. per 100 Gms. Solvent at 25°.
Water	0.021	0.046	Chloroform	5.55
Alcohol	0.324	0.363 (60°)	Ether	0.873
Benzene	4.0	...	Amyl Alcohol	3.33
			Carbon Disulphide	0.43

**CHRYSEN**  $C_{18}H_{12}$ .

## SOLUBILITY IN TOLUENE AND IN ABS. ALCOHOL.

(v. Becchi.)

100 gms. toluene dissolve 0.24 gm.  $C_{18}H_{12}$  at 18°, and 5.39 gms. at 100°.100 gms. abs. alcohol dissolve 0.097 gm.  $C_{18}H_{12}$  at 16°, and 0.170 gm. at b. pt. \***CINCHONA ALKALOIDS.** (See also Quinine, p. 269.)

## SOLUBILITY OF CINCHONINE, CINCHONIDINE, QUININE, AND QUINIDINE IN SEVERAL SOLVENTS AT 18°-22°.

(Müller — Apoth.-Ztg. 18, 233, '03; see also Prunier — J. pharm. chim. [4] 29, 136, '79.)

Grams of the Alkaloid per 100 Grams Solution.

Solvent.	Cinchonine $C_{19}H_{23}N_3O$ .	Cinchonidine $C_{19}H_{23}N_3O$ .	Quinine $C_{20}H_{24}N_2O_2$ .		Quinidine $C_{20}H_{24}N_2O_2$ .
			Hydrate.	Anhydride.	
Ether	0.10	0.211	1.619	0.876	0.776
Ether sat. with $H_2O$	0.123	0.523	5.618	2.794	1.629
$H_2O$ sat. with Ether	0.025	0.0306	0.0667	0.0847	0.031
Benzene	0.0545	0.099	0.2054	1.700	2.451
Chloroform	0.6979	9.301	100+	100+	100+
Acetic Ether	0.0719	0.3003	4.65	2.469	1.761
Petroleum Ether	0.0335	0.0475	0.0103	0.0211	0.0241
Carbon Tetra Chloride	0.0361	0.0508	0.203	0.529	0.565
Water	0.0239	0.0255	0.574	0.0506	0.0202
Glycerine (15.5°)	0.50	...	0.50	...	...

100 grams chloroform dissolve 0.565 gm. cinchonine at 50°.

100 grams abs. ether dissolve 0.264 gm. cinchonidine at 32°.

(Köhler — Z. anal. Ch. 18, 242, '79.)

## SOLUBILITY OF CINCHONINE AND CINCHOTINE SULPHATE, TARTRATE, BITARTRATE, OXALATE, AND HYDROCHLORIDE IN WATER.

(Forst and Böhringer — Ber. 14, 1266, '81.)

## Cinchonine Salts.

## Cinchotine Salts.

Formula.	t°.	Gms. per 100 Gms. $H_2O$ .	Formula.	t°.	Gms. per 100 Gms. $H_2O$ .
$2(C_{19}H_{23}N_3O)SO_4H_2 \cdot 2H_2O$	13	1.52	$2(C_{19}H_{23}N_3O)SO_4H_2 \cdot 2H_2O$	13	3.28
$2(C_{19}H_{23}N_3O)C_4H_4O_6 \cdot 2H_2O$	16	3.0	$2(C_{19}H_{23}N_3O)C_4H_4O_6 \cdot 2H_2O$	16	1.76
$C_{19}H_{23}N_3O \cdot C_4H_4O_6 \cdot 4H_2O$	16	0.99	$C_{19}H_{23}N_3O \cdot C_4H_4O_6 \cdot 4H_2O$	16	1.28
$2(C_{19}H_{23}N_3O) \cdot C_2H_2O_4 \cdot H_2O$	20	0.96	$2(C_{19}H_{23}N_3O) \cdot C_2H_2O_4 \cdot H_2O$	10	1.16
$C_{19}H_{23}N_3O \cdot HCl \cdot 2H_2O$	10	4.16	$C_{19}H_{23}N_3O \cdot HCl \cdot 2H_2O$	10	2.12

## SOLUBILITY OF CINCHONINE SULPHATE AND OF CINCHONIDINE SULPHATE IN SEVERAL SOLVENTS.

(U. S. P.)

Solvent.	Gms. $(C_{19}H_{23}N_3O)_2H_2SO_4 \cdot 2H_2O$ per 100 Gms. Solvent.		Gms. $(C_{19}H_{23}N_3O)_2H_2SO_4 \cdot 3H_2O$ per 100 Gms. Solvent.	
	At 25°.	At 80°.	At 25°.	At 80°.
Water	1.72	3.1	1.60	4.80
Alcohol	10.0	19.2 (60°)	1.4	3.1 (60°)
Ether	0.04	...	0.02	...
Chloroform	1.45	...	0.11	...
Glycerine	6.7 (15°)	...	...	...



# CINNAMIC ACID

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## CINNAMIC ACID $C_6H_5CH:CH.CO_2H$ .

SOLUBILITY OF CINNAMIC ACID IN AQUEOUS SOLUTIONS OF SODIUM ACETATE, BUTYRATE, FORMATE, AND SALICYLATE AT  $26.4^\circ$ .  
(Philip — J. Chem. Soc. 87, 992, '05.)

Calculated from the original results, which are given in terms of molecular quantities per liter.

Gms. Na Salt per Liter.	Gms. $C_6H_5CH:CH.CO_2H$ per Liter in Solutions of:			
	$CH_3COONa$ .	$C_2H_7COONa$ .	$HCOONa$ .	$C_6H_4.OH.COONa$ .
0	0.56	0.56	0.56	0.56
1	1.50	1.30	0.92	0.62
2	2.12	1.85	1.12	0.70
3	2.52	2.25	1.27	0.73
4	2.85	2.60	1.40	0.77
5	3.05	2.90	1.47	0.80
8	...	...	...	0.90

1 liter of aqueous solution contains 0.491 gm.  $C_6H_5CH:CH.CO_2H$  at  $25^\circ$  (Paul).

SOLUBILITY OF CINNAMIC ACID IN AQUEOUS SOLUTIONS OF ANILIN AND OF PARA TOLUIDIN AT  $25^\circ$ .  
(Lowenherz — Z. physik. Chem. 25, 394, '98.)

Original results in terms of molecular quantities per liter.

In Aqueous Anilin.		In Aqueous <i>p</i> Toluidin.	
Grams per Liter.		Grams per Liter.	
$C_6H_5NH_2$ .	$C_6H_5CH:CH.CO_2H$ .	$C_6H_4CH_3NH_2$ .	$C_6H_5CH:CH.CO_2H$ .
0	0.49	0	0.49
1	1.20	1	1.52
2	1.65	2	2.20
3	2.02	3	2.83
4	2.35	4	3.35
6	2.92	5	3.80

SOLUBILITY OF CINNAMIC ACID IN METHYL, ETHYL, AND PROPYL ALCOHOLS.

(Timofeiew — Compt. rend. 112, 1137, '91.)

$t^\circ$ .	Grams $C_6H_5CH:CH.CO_2H$ per 100 Grams of:		
	$CH_3OH$ .	$C_2H_5OH$ .	$C_3H_7OH$ .
0	20.65	15.61	10.63
19.5	28.91	22.03	15.41

SOLUBILITY OF BROM CINNAMIC ACIDS.

$\alpha$  Brom and  $\beta$  Brom Cinnamic Acid in Water at  $25^\circ$ .

(Paul — Z. physik. Chem. 14, 111, '94.)

$\alpha$  Brom Cinnamic Acid in Aq. Solutions of Oxalic Acid at  $25^\circ$ .

(Noyes — Z. physik. Chem. 6, 245, '90.)

Acid.	Per 1000 cc. Solution.		Normality of Solutions.		Grams per Liter.	
	Grams.	Millimols.	$(COOH)_2$ .	$C_6H_5CH:CH:COOH$ .	$(COOH)_2$ .	$C_6H_5CH:CH:COOH$ .
$\alpha$ , $C_6H_5CH:CHBr.CO_2H$	3.9325	17.32	0	0.0176	0.0	3.995
$\beta$ , $C_6H_5CHBr:CH.CO_2H$	0.5255	2.315	0.0275	0.0140	2.448	3.178
			0.0524	0.0129	4.716	2.928

**CITRIC ACID**  $C_3H_4(OH)(COOH)_3 \cdot H_2O$ .**SOLUBILITY IN SEVERAL SOLVENTS.**

(U. S. P.; Bourgoin — Ann. chim. phys. [5] 13, 406, '78.)

Solvent.	t°.	Gms. $C_3H_4(OH)(COOH)_3 \cdot H_2O$ per 100 Gms.	
		Solution.	Solvent.
Water	25	64.8	185
Water	b. pt.	70.3	250
Alcohol (90%)	25	34.6	75.9
Alcohol (U.S.P.)	"	39.2	64.5
Alcohol (Abs.)	"	43.2	52.8
Ether	"	2.21	2.26
Ether (U.S.P.)	"	5.2	5.55

**COBALT BROMIDE**  $CoBr_2$ .**SOLUBILITY IN WATER.**

(Etard — Ann. chim. phys. [7] 2, 537, '94.)

t°.	59°.	75°.	97°.
Gms. $CoBr_2$ per 100 gms. solution	66.7	66.8	68.1 (blue)

**COBALT DOUBLE SALTS.****SOLUBILITY IN WATER.**

(Jørgensen — J. pr. Chem. [2] 18, 205, '78; 19, 49, '79; Kurnakoff — J. russ. phys. chem. Ges. 24, 629, '92.)

Name.	Formula.	t°.	Gms. Salt per 100 Gms. $H_2O$ .
Chloro purpureo cobaltic bromide	$CoCl(NH_3)_5Br_2$	14.3	0.467
Bromo purpureo cobaltic bromide	$CoBr(NH_3)_5Br_2$	16	0.19
Chloro tetra amine cobaltic chloride	$CoCl(NH_3)_4(OH_2)Cl_2$		2.50
Chloro purpureo cobaltic chloride	$CoCl(NH_3)_5Cl_2$	0	0.232
Chloro purpureo cobaltic chloride	$CoCl(NH_3)_5Cl_2$	15.5	0.41
Chloro purpureo cobaltic chloride	$CoCl(NH_3)_5Cl_2$	46.6	1.03
Luteo cobaltic chloride	$Co(NH_3)_6Cl_3$	0	4.26
Luteo cobaltic chloride	$Co(NH_3)_6Cl_3$	46.6	12.74
Roseo cobaltic chloride	$Co(NH_3)_5(OH_2)Cl_3$	0	16.12
Roseo cobaltic chloride	$Co(NH_3)_5(OH_2)Cl_3$	16.2	24.87
Chloro purpureo cobaltic iodide	$CoCl(NH_3)_5I_2$	19.2	2.0
Chloro purpureo cobaltic nitrate	$CoCl(NH_3)_5(NO_3)_2$	15	1.25
Chloro purpureo cobaltic sulphate	$CoCl(NH_3)_5SO_4 \cdot 2H_2O$	17.3	0.75
Nitrato purpureo cobaltic nitrate	$Co(NO_3)_4(NH_3)(NO_3)_2$	16	0.36

**COBALT CHLORATE**  $Co(ClO_3)_2$ .**SOLUBILITY IN WATER.**

(Meusser — Ber. 35, 1419, '02.)

t°.	Gms. $Co(ClO_3)_2$ per 100 Gms. Solution.	Mols. $Co(ClO_3)_2$ per 100 Mols. $H_2O$ .	Solid Phase.	t°.	Gms. $Co(ClO_3)_2$ per 100 Gms. Solution.	Mols. $Co(ClO_3)_2$ per 100 Mols. $H_2O$ .	Solid Phase.
-12	29.97	3.41	Ice	18	64.19	14.28	$Co(ClO_3)_2 \cdot 4H_2O$ .
-21	53.30	9.08	$Co(ClO_3)_2 \cdot 6H_2O$ .	21	64.39	14.51	"
-19	53.61	9.20	"	35	67.09	16.10	"
0	57.45	10.75	"	47	69.66	18.29	"
10.5	61.83	12.90	"	61	76.12	25.39	"

Density of solution saturated at 18° = 1.861.

# COBALT CHLORIDE

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## COBALT CHLORIDE $\text{CoCl}_2$ .

### SOLUBILITY IN WATER.

(Etard — Compt. rend. 113, 699, '91; Ann. chim. phys. [7] 2, 537, '94.)

t°.	Gms. $\text{CoCl}_2$ per 100 Gms. Solution.	Solid Phase.	t°.	Gms. $\text{CoCl}_2$ per 100 Gms. Solution.	Solid Phase.
-10	27.0	$\text{CoCl}_2 \cdot 6\text{H}_2\text{O}$ (red)	35	38.0	$\text{CoCl}_2 \cdot \text{H}_2\text{O}$ (violet)
0	29.5	"	40	41.0	"
+10	31.5	"	50	47.0	"
20	33.5	"	60	47.5	$\text{CoCl}_2 \cdot \text{H}_2\text{O}$ (blue)
25	34.5	"	80	49.5	"
30	35.5	"	100	51.0	"

### SOLUBILITY OF COBALT AMMONIUM CHLORIDES IN WATER.

(Kurnakoff — J. russ. phys. chem. Ges. 24, 629, '93; J. Chem. Soc. 64, ii, 509, '93.)

Salt.	Grams per 100 Grams $\text{H}_2\text{O}$ at:		
	0°.	16.9°.	46.6°.
$\text{CoCl}_2 \cdot 5\text{NH}_3$	0.232	...	1.031
$\text{CoCl}_2 \cdot 5\text{NH}_3 \cdot \text{H}_2\text{O}$	16.12	24.87	...
$\text{CoCl}_2 \cdot 6\text{NH}_3$	4.26	...	12.74

### SOLUBILITY OF COBALT CHLORIDE IN AQUEOUS HYDROCHLORIC ACID SOLUTIONS AT 0°.

(Engel — Ann. chim. phys. [6] 7, 355, '89.)

Milligram Mols. per 10 cc. Sol.		Sp. Gr. of Solutions.	Gms. per 100 Gms. Solution.		Gms. per 100 cc. Solution.	
$\frac{1}{2}\text{CoCl}_2$ .	HCl.		$\text{CoCl}_2$ .	HCl.	$\text{CoCl}_2$ .	HCl.
62.4	0	1.343	30.17	0.00	40.5	0
58.52	3.7	1.328	28.62	0.102	38.0	0.135
50.8	11.45	1.299	25.39	0.321	33.0	0.417
37.25	25.2	1.248	19.43	0.738	24.2	0.919
12.85	55.0	1.167	7.15	1.718	8.34	2.00
4.75	74.75	1.150	2.68	2.369	3.08	2.72
12.0	104.5	1.229	6.34	3.099	7.79	3.81
25.0	139.0	1.323	12.27	3.829	16.24	5.07

### SOLUBILITY OF COBALT CHLORIDE IN AQUEOUS ALCOHOL

AT 11.5°.

(Böttker — Z. physik. Chem. 22, 509, '97.)

10 gms. of  $\text{CoCl}_2 \cdot 6\text{H}_2\text{O}$  were added to 20 cc. of alcohol and in addition the amounts of  $\text{CoCl}_2$  shown in the second column. The solutions were shaken 2 hours, 5 cc. withdrawn, and the amount of dissolved  $\text{CoCl}_2$  determined by evaporation and weighing.

Vol. % Alcohol.	Gms. $\text{CoCl}_2$ Added.	Gms. per 5 cc. Solution.		Vol. % Alcohol.	Gms. $\text{CoCl}_2$ Added.	Gms. per 5 cc. Sol.	
		$\text{H}_2\text{O}$ .	$\text{CoCl}_2$ .			$\text{H}_2\text{O}$ .	$\text{CoCl}_2$ .
91.3	0.0	1.325	1.168	99.3	0.612	0.764	1.459
98.3	0.0	1.134	1.214	99.3	0.813	0.688	1.568
98.3	0.0	1.068	1.181	99.3	1.022	0.634	1.713
99.3	0.0	1.045	1.199	99.3	1.240	0.553	1.831
99.3	0.194	0.899	1.204	99.3	1.446	0.483	1.943
99.3	0.400	0.829	1.325	99.3	1.650	0.500	2.183

100 gms. sat. solution in alcohol (0.792 Sp. Gr.) contain 23.66 gms.  $\text{CoCl}_2$ . Sp. Gr. = 1.0107.

(Winkler — J. pr. Chem. 91, 207, '64.)

## SOLUBILITY OF COBALT CHLORIDE IN ORGANIC SOLVENTS.

Solvent.	t°.	Gms. per 100 Gms. Solvent.		Authority.
		CoCl <sub>2</sub> .	CoCl <sub>2</sub> ·2H <sub>2</sub> O.	
Acetone	0	9.11	17.16	(St. von Laszczynski — Ber. 27, 2285, '94.)
"	22.5	9.28	17.06	(St. von Laszczynski — Ber. 27, 2285, '94.)
"	25	8.62	...	(Krug and McElroy — J. Anal. Ch. 6, 184, '92.)
"	18	2.75	...	(Naumann — Ber. 37, 4332, '04.)
Ethyl Acetate	14	0.08	...	(St. von Laszczynski.)
"	79	0.26	...	"
Ether	...	0.021	0.0201	(Böttker — Z. physik. Chem. 22, 509, '97.)
Glycol	...	10.7 (per 100 g. sol.)	...	(de Coninck — Bull. acad. roy. Belgique, 359, '05.)

COBALT IODATE Co(IO<sub>3</sub>)<sub>2</sub>.SOLUBILITY IN WATER.  
(Meusser — Ber. 34, 2435, '01.)

t°.	Solid Phase: Co(IO <sub>3</sub> ) <sub>2</sub> ·4H <sub>2</sub> O.		Co(IO <sub>3</sub> ) <sub>2</sub> ·2H <sub>2</sub> O.		Co(IO <sub>3</sub> ) <sub>2</sub> .	
	G.	M.	G.	M.	G.	M.
0	0.54	0.028	0.32	0.014	...	...
18	0.83	0.038	0.45	0.020	1.03	0.046
30	1.03	0.046	0.52	0.023	0.89	0.040
50	1.46	0.065	0.67	0.030	0.85	0.030
60	1.86	0.084	...	...	...	...
65	2.17	0.098	...	...	...	...
75	...	...	0.84	0.038	0.75	0.033
100	...	...	1.02	0.045	0.69	0.031

G = Gms. Co(IO<sub>3</sub>)<sub>2</sub> per 100 gms. solution. M = Mols. Co(IO<sub>3</sub>)<sub>2</sub> per 100 Mols. H<sub>2</sub>O.

COBALT IODIDE CoI<sub>2</sub>.

## SOLUBILITY IN WATER.

(Etard — Compt. rend. 113, 699, '91; Ann. chim. phys. [7] 2, 537, '94.)

The accuracy of these results is doubtful.

t°.	Gms. CoI <sub>2</sub> per 100 Gms. Solution.	Solid Phase.	t°.	Gms. CoI <sub>2</sub> per 100 Gms. Solution.	Solid Phase.
-10	55.5	CoI <sub>2</sub> ·H <sub>2</sub> O (green)	25	67.5	CoI <sub>2</sub> ·H <sub>2</sub> O (olive)
0	58.0	"	30	70.0	"
10	61.5	"	40	75.0	CoI <sub>2</sub> ·H <sub>2</sub> O (yellow)
15	63.2	"	50	79.0	"
20	65.2	"	80	80.0	"
25	67	"	110	81.0	"

COBALT NITRATE Co(NO<sub>3</sub>)<sub>2</sub>.

## SOLUBILITY IN WATER.

(Funk — Wism. Abh. p. t. Reichsanstalt 3, 439, '00.)

t°.	Gms. Co(NO <sub>3</sub> ) <sub>2</sub> per 100 Gms. Solution.		Solid Phase.	t°.	Gms. Co(NO <sub>3</sub> ) <sub>2</sub> per 100 Gms. Solution.		Solid Phase.
	Mols. per 100 Mols. H <sub>2</sub> O.	Mols. Co(NO <sub>3</sub> ) <sub>2</sub> per 100 Mols. H <sub>2</sub> O.			Mols. per 100 Mols. H <sub>2</sub> O.	Mols. Co(NO <sub>3</sub> ) <sub>2</sub> per 100 Mols. H <sub>2</sub> O.	
-26	39.45	6.40	Co(NO <sub>3</sub> ) <sub>2</sub> ·9H <sub>2</sub> O	41	55.96	12.5	Co(NO <sub>3</sub> ) <sub>2</sub> ·6H <sub>2</sub> O
-20.5	42.77	7.35	"	56	62.88	16.7	"
-21	41.55	6.98	Co(NO <sub>3</sub> ) <sub>2</sub> ·6H <sub>2</sub> O	55	61.74	15.8	Co(NO <sub>3</sub> ) <sub>2</sub> ·3H <sub>2</sub> O
-10	43.69	7.64	"	62	62.88	16.7	"
-4	44.85	7.99	"	70	64.89	18.2	"
0	45.66	8.26	"	84	68.84	21.7	"
+18	49.73	9.71	"	91	77.21	33.3	"

Density of solution saturated at 18° = 1.575.

# COBALT NITRATE

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## SOLUBILITY OF COBALT NITRATE IN GLYCOL.

(de Coninck — Bull. acad. roy. Belgique, 359, '05.)

100 grams saturated solution contain 80 gms. Cobalt Nitrate.

# COBALT RUBIDIUM NITRITE $\text{Rb}_2\text{Co}(\text{NO}_2)_6 \cdot \text{H}_2\text{O}$ .

100 grams  $\text{H}_2\text{O}$  dissolve 0.005 gram of the salt.

(Rosenbladt — Ber. 19, 2531, '86.)

# COBALT SULPHATE $\text{CoSO}_4 \cdot 7\text{H}_2\text{O}$ .

## SOLUBILITY IN WATER.

(Mulder; Tobler — Liebig's Ann. 95, 193, '55; Koppel — Wetzel — Z. physik. Chem. 52, 395, '05.)

t°.	Gms. $\text{CoSO}_4$ per 100 Gms.		Mols. $\text{CoSO}_4$ per 100 Mols. $\text{H}_2\text{O}$ .	t°.	Gms. $\text{CoSO}_4$ per 100 Gms.		Mols. $\text{CoSO}_4$ per 100 Mols. $\text{H}_2\text{O}$ .
	Solution.	Water.			Solution.	Water.	
0	20.35	25.55	2.958	35	31.40	45.80	5.31
5	21.90	28.03	3.251	40	32.81	48.85	5.664
10	23.40	30.55	3.540	50	35.56	55.2	...
15	24.83	33.05	3.831	60	37.65	60.4	...
20	26.58	36.21	4.199	70	39.66	65.7	...
25	28.24	39.37	4.560	80	41.18	70.0	...
30	29.70	42.26	4.903	100	45.35	83.0	...

## SOLUBILITY OF MIXTURES OF $\text{CoSO}_4 \cdot 7\text{H}_2\text{O}$ AND $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$ IN WATER.

(Koppel; Wetzel.)

t°.	Gms. per 100 Gms. Solution.		Gms. per 100 Gms. $\text{H}_2\text{O}$ .		Mols. per 100 Mols. $\text{H}_2\text{O}$ .		Solid Phase.
	$\text{CoSO}_4$ .	$\text{Na}_2\text{SO}_4$ .	$\text{CoSO}_4$ .	$\text{Na}_2\text{SO}_4$ .	$\text{CoSO}_4$ .	$\text{Na}_2\text{SO}_4$ .	
0	16.56	7.63	21.85	10.07	2.54	1.27	$\text{CoSO}_4 \cdot 7\text{H}_2\text{O} +$ $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$
5	17.46	9.59	23.94	13.15	2.77	1.67	"
10	17.90	11.73	25.41	16.67	2.94	2.11	"
20	17.59	16.43	26.65	24.91	3.09	3.15	$\text{CoNa}_2(\text{SO}_4)_2 \cdot 4\text{H}_2\text{O}$
25	17.06	15.70	25.36	23.32	2.95	2.97	"
30	15.94	14.93	23.15	21.61	2.70	2.74	"
35	15.73	14.52	22.54	20.85	2.62	2.64	"
40	14.87	14.22	20.98	20.05	2.46	2.53	"
18.5	18.75	15.61	28.61	23.82	3.32	3.02	$\text{CoNa}_2(\text{SO}_4)_2 \cdot 4\text{H}_2\text{O}$ $+ \text{CoSO}_4 \cdot 7\text{H}_2\text{O}$
20	19.30	15.10	29.42	23.01	3.41	2.92	"
25	20.30	13.60	30.74	20.58	3.56	2.61	"
30	21.67	12.05	32.70	18.17	3.79	2.30	"
35	22.76	10.43	34.06	15.61	3.95	1.98	"
40	24.05	9.16	35.01	13.72	4.81	1.74	"
18.5	16.87	16.97	25.50	25.65	2.96	3.25	$\text{CoNa}_2(\text{SO}_4)_2 \cdot 4\text{H}_2\text{O}$ $+ \text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$
20	15.41	18.12	23.18	27.26	2.69	3.45	"
25	10.63	23.26	16.07	35.17	1.86	4.46	"
30	6.01	28.67	9.20	43.74	1.07	5.54	"
35	4.56	32.14	7.19	50.79	0.835	6.44	$\text{CoNa}_2(\text{SO}_4)_2 \cdot 4\text{H}_2\text{O}$ $+ \text{Na}_2\text{SO}_4$
40	4.72	31.78	7.45	50.10	0.864	6.34	"

SOLUBILITY OF COBALT SULPHATE IN METHYL AND ETHYL ALCOHOL  
AND IN GLYCOL.

Solvent.	t°.	Gms. per 100 Gms. Solvent.		Observer.
		CoSO <sub>4</sub> .	CoSO <sub>4</sub> .7H <sub>2</sub> O.	
Methyl Alcohol (abs.)	3	...	42.8	(de Bruyn—Z. physik. Ch. 10, 784, '92.)
"	15	...	50.9	"
"	18	1.04	54.5	"
" (93.5%)	3	...	13.3	"
" (50%)	3	...	1.8	"
Ethyl Alcohol (abs.)	3	...	2.5	"
Glycol	..	(per 100gms. solution)	3.1	(de Coninck—Bull. acad. roy. Belgique, 359, '05.)

**COCAINE** C<sub>17</sub>H<sub>21</sub>NO<sub>4</sub>.

**COCAINE HYDROCHLORIDE** C<sub>17</sub>H<sub>21</sub>NO<sub>4</sub>.HCl.

SOLUBILITY IN SEVERAL SOLVENTS.  
(U. S. P.; at 18°-22°; Müller—Apoth.-Ztg. 18, 248, '03.)

Solvent.	t°.	Gms. per 100 Gms. Solvent.		Solvent.	t°.	Gms. C <sub>17</sub> H <sub>21</sub> NO <sub>4</sub> . per 100 Gms. Solvent.
		C <sub>17</sub> H <sub>21</sub> NO <sub>4</sub> .	C <sub>17</sub> H <sub>21</sub> NO <sub>4</sub> .HCl.			
Water	25	0.17	250	Ether+H <sub>2</sub> O	18-22	34.0
Water	80	0.38	1000	H <sub>2</sub> O+Ether	18-22	0.254
Alcohol	25	20.0	38	Benzene	18-22	100
Ether (U.S.P.)	25	26.3	...	CCl <sub>4</sub>	17	18.5
Ether	18-22	11.6	...	Acetic Ether	18-22	58.99
Chloroform	18-22	100+	...	Petroleum Ether	18-22	2.37

**CODEINE** C<sub>18</sub>H<sub>21</sub>NO<sub>3</sub>.H<sub>2</sub>O, also the Phosphate and Sulphate.

**COLOCHICINE** C<sub>22</sub>H<sub>23</sub>NO<sub>6</sub>.

SOLUBILITY IN SEVERAL SOLVENTS.  
(U. S. P.; at 18°-22°, Müller.)

Solvent.	t°.	Grams. per 100 Grams Solvent.			
		C <sub>18</sub> H <sub>21</sub> NO <sub>3</sub> H <sub>2</sub> O.	Codeine H <sub>3</sub> PO <sub>4</sub> .2 Aq.	Codeine H <sub>2</sub> SO <sub>4</sub> .5 Aq.	C <sub>22</sub> H <sub>23</sub> NO <sub>6</sub> .
Water	18-22	...	...	..	9.616
Water	25	1.13	44.9	3.3	4.5
Water	80	1.70	217.0	16.0	5.0
Alcohol	25	62.5	0.383	0.096	...
Alcohol	60	108.7	1.03	0.27	...
Ether	25	8.0	0.075	...	0.64
Ether	18-22	...	...	...	0.126
Ether sat. with H <sub>2</sub> O	18-22	...	...	...	0.18
H <sub>2</sub> O sat. with Ether	18-22	...	...	...	12.05
Benzene	18-22	...	...	...	0.939
Benzene	25	...	...	...	1.15
Chloroform	25	151.5	0.015	...	100+
Carbon Tetra Chloride	17	1.328	...	...	0.121
Acetic Ether	18-22	...	...	..	1.342
Petroleum Ether	18-22	...	...	...	0.058

# COLLIDINE

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## COLLIDINE (2, 4, 6, Tri Methyl Pyridine) $C_6H_3N(CH_3)_3$ .

SOLUBILITY IN WATER.  
(Rothmund — Z. physik. Chem. 26, 433, '98.)

t°.	Gms. Collidin per 100 Gms.		t°.	Gms. Collidin per 100 Gms.	
	Aq. Layer.	Collidin Layer.		Aq. Layer.	Collidin Layer.
5.7 (crit. t.)	17.20				
10	7.82	41.66	80	1.73	86.12
20	3.42	54.92	100	1.78	88.07
30	2.51	62.80	120	1.82	88.98
40	1.93	70.03	140	2.19	89.10
60	1.76	80.19	160	2.93	87.2
			180	3.67	...

## COPPER ACETATE $Cu(C_2H_3O_2)_2 \cdot H_2O$ .

100 grams of glycerine dissolve 10 grams of copper acetate at 15.5°.

## COPPER BROMIDE (ous) $Cu_2Br_2$ .

SOLUBILITY OF CUPROUS BROMIDE IN AQUEOUS SOLUTIONS OF POTASSIUM BROMIDE AT 18°–20°.

(Bodländer and Storbeck — Z. anorg. Chem. 31, 460, '02.)

Millimols per Liter.					Grams. per Liter.			
KBr.	Total Cu.	Total Br.	Cu (ic).	Cu (ous).	KBr.	Total Cu.	Cu (ic).	Cu (ous).
0	0.3157	0.4320	0.2006	0.1061	0	0.0201	0.0133	0.0067
25	0.119	...	0.012	0.107	2.98	0.0076	0.0007	0.0068
40	0.200	...	0.013	0.187	4.76	0.0127	0.0007	0.0119
60	0.310	...	0.025	0.285	7.15	0.0197	0.0015	0.0181
80	0.423	...	0.012	0.411	9.53	0.0266	0.0007	0.0261
100	0.584	...	...	0.584	11.91	0.0371	...	0.0371
120	0.693	...	...	0.693	14.29	0.0441	...	0.0441
500	8.719	...	...	8.719	59.55	0.5540	...	0.5540

## COPPER CHLORATE (ic) $Cu(ClO_3)_2 \cdot 4H_2O$ .

SOLUBILITY IN WATER.  
(Meusser — Ber. 35, 1420, '02.)

t°.	Gms. $Cu(ClO_3)_2$ per 100 Gms. Solution.	Mols. $Cu(ClO_3)_2$ per 100 Mols. $H_2O$ .	Solid Phase.	t°.	Gms. $Cu(ClO_3)_2$ per 100 Gms. Solution.	Mols. $Cu(ClO_3)_2$ per 100 Mols. $H_2O$ .	Solid Phase.
-12	30.53	3.43	Ice	18	62.17	12.84	$Cu(ClO_3)_2 \cdot 4H_2O$
-31	54.59	9.39	$Cu(ClO_3)_2 \cdot 4H_2O$	45	66.17	15.28	"
-21	57.12	10.41	"	59.6	69.42	17.73	"
+0.8	58.51	11.02	"	71	76.9	25.57	"

Density of solution saturated at 18° = 1.695.

## COPPER CHLORIDE (ic) $CuCl_2$ .

SOLUBILITY IN WATER.

(Reicher and Deventer — Z. physik. Chem. 5, 560, '90; see also Etard — Ann. chim. phys. [7] 2, 528, '94.)

t°.	Gms. $CuCl_2$ per 100 Gms. Solution.	t°.	Gms. $CuCl_2$ per 100 Gms. Solution.	t°.	Gms. $CuCl_2$ per 100 Gms. Solution.
0	41.4	25	44.0	50	46.65
10	42.45	30	44.55	60	47.7
20	43.5	40	45.6	80	49.8
				100	51.9

Density of solution saturated at 0° = 1.511, at 17.5° = 1.579.

### SOLUBILITY OF CUPRIC CHLORIDE IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID AT 0°.

(Engel — Ann. chim. phys. [6] 17, 351, '89.)

Milligram Mols. per 10 cc. Sol.		Sp. Gr. of Solutions.	Gms. per 100 cc. Sol.		Gms. per 100 Gms. Sol.	
$\frac{1}{2}$ CuCl <sub>2</sub> .	HCl.		CuCl <sub>2</sub> .	HCl.	CuCl <sub>2</sub> .	HCl.
91.75	0	1.49	61.70	0.0	41.41	0.0
86.8	4.5	1.475	58.37	1.64	39.58	1.11
83.2	7.8	1.458	55.95	2.84	38.37	1.95
79.35	10.5	1.435	53.37	3.83	37.19	2.67
68.4	20.25	1.389	46.01	7.38	33.11	5.31
50.0	37.5	1.319	33.62	13.67	25.50	10.37
22.8	70.25	1.231	15.33	25.61	12.46	20.80
23.5	102.5	1.288	15.81	37.36	12.27	29.00
26.7	128.0	1.323	17.96	46.66	13.57	35.26
			29.0	Sat. HCl		

### SOLUBILITY OF CUPROUS CHLORIDE IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID.

(Engel — *Ibid.* [6] 17, 372, '89; Compt. rend. 121, 529, '95.)

Milligram Mols. per 10 cc. Sol.		Sp. Gr. of Solutions.	Gms. per 100 cc. Sol.		Gms. per 100 Gms. Sol.	
$\frac{1}{2}$ Cu <sub>2</sub> Cl <sub>2</sub> .	HCl.		Cu <sub>2</sub> Cl <sub>2</sub> .	HCl.	Cu <sub>2</sub> Cl <sub>2</sub> .	HCl.
Results at 0°.						
0.475	8.975	1.05	0.471	0.327	0.448	0.312
1.5	17.5	1.049	1.486	0.638	1.418	0.608
2.9	26.0	1.065	2.872	0.948	2.697	0.932
4.5	34.5	1.080	4.457	1.257	4.127	1.164
8.25	47.8	1.135	8.172	1.743	7.199	1.535
15.5	68.5	1.261	15.7	2.497	12.46	1.980
33.0	104.0	1.345	32.68	3.827	24.30	2.845
Results at 15°-16°.						
7.4	54.4	1.19	7.33	1.983	6.159	1.666
10.8	68.9	1.27	10.69	2.511	8.422	1.977
12.8	75.0	1.29	12.68	2.734	9.826	2.119
16.0	92.0	1.38	15.84	3.346	11.48	2.424

### COPPER CHLORIDE, AMMONIUM CHLORIDE MIXTURES IN AQUEOUS SOLUTION AT 30°.

(Meerburg — Z. anorg. Chem. 45, 3, '05.)

Grams per 100 Gms. Sat. Solution.		Grams per 100 Gms. Solid Phase.		Solid Phase
CuCl <sub>2</sub> .	NH <sub>4</sub> Cl.	CuCl <sub>2</sub> .	NH <sub>4</sub> Cl.	
0	29.5	...	...	NH <sub>4</sub> Cl
1.9	28.6	6.0	48.2	NH <sub>4</sub> Cl + CuCl <sub>2</sub> ·2NH <sub>4</sub> Cl·2H <sub>2</sub> O
3.6	25.9	37.0	34.9	CuCl <sub>2</sub> ·2NH <sub>4</sub> Cl·2H <sub>2</sub> O
10.5	16.5	21.7	23.1	"
19.9	9.4	28.5	18.4	"
29.4	4.9	35.1	15.3	"
41.4	2.1	43.1	13.3	"
43.2	2.0	51.9	6.6	CuCl <sub>2</sub> ·2NH <sub>4</sub> Cl·2H <sub>2</sub> O + CuCl <sub>2</sub> ·2H <sub>2</sub> O
43.9	0	...	...	CuCl <sub>2</sub> ·2H <sub>2</sub> O



**COPPER AMMONIUM  
CHLORIDE**

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**COPPER AMMONIUM CHLORIDE**  $\text{CuCl}_2 \cdot 2\text{NH}_4\text{Cl} \cdot 2\text{H}_2\text{O}$ .

**SOLUBILITY IN WATER.**  
(Meerburg.)

t°.	Gms. $\text{CuCl}_2 \cdot 2\text{NH}_4\text{Cl}$ per 100 Gms. Solution.	Solid Phase.	t°.	Gms. $\text{CuCl}_2 \cdot 2\text{NH}_4\text{Cl}$ per 100 Gms. Solution.	Solid Phase.
-10.5	3.87	Ice	30	27.70	$\text{CuCl}_2 \cdot 2\text{NH}_4\text{Cl} \cdot 2\text{H}_2\text{O}$
-10.8	20.12	Ice	40	30.47	"
-11	20.3	$\text{Ice} + \text{CuCl}_2 \cdot 2\text{NH}_4\text{Cl} \cdot 2\text{H}_2\text{O}$	50	33.24	"
-10	20.46	$\text{CuCl}_2 \cdot 2\text{NH}_4\text{Cl} \cdot 2\text{H}_2\text{O}$	60	36.13	"
0	22.02	"	70	39.35	"
12	24.26	"	80	43.36	"
20	25.95	"			

**SOLUBILITY OF CUPROUS CHLORIDE IN AQUEOUS SOLUTIONS OF CUPRIC  
SULPHATE AT ABOUT 20°.**

(Bodländer and Storbeck — Z. anorg. Chem. 31, 22, '02.)

Millimols per Liter.					Grams per Liter.				
$\text{CuSO}_4$ .	Total Cu.	Total Cl.	Cu(ic).	Cu(ous).	$\text{CuSO}_4$ .	Total Cu.	Total Cl.	Cu(ic).	Cu(ous).
0	2.880	5.312	2.258	0.622	0.0	0.183	0.188	0.143	0.040
0.987	3.602	4.908	3.145	0.457	0.158	0.229	0.174	0.200	0.029
1.975	4.553	4.687	4.131	0.422	0.315	0.290	0.166	0.263	0.027
2.962	5.193	4.256	4.625	0.509	0.473	0.330	0.151	0.292	0.032
4.937	7.276	4.329	6.546	0.730	0.788	0.463	0.154	0.416	0.046

**SOLUBILITY OF CUPROUS CHLORIDE IN AQUEOUS SOLUTIONS OF POTASSIUM  
CHLORIDE AT 18°-20° EXCEPT DETERMINATIONS IN 3RD, 7TH, 8TH, AND  
LAST LINE, WHICH ARE AT 16°.**

(Bodländer and Storbeck.)

Millimols per Liter.					Grams per Liter.				
KCl.	Total Cu.	Total Cl.	Cu(ic).	Cu(ous).	KCl.	Total Cu.	Total Cl.	Cu(ic).	Cu(ous).
0	2.851	5.436	2.222	0.629	0.0	0.181	0.193	0.141	0.040
2.5	1.955	6.015	1.421	0.534	0.186	0.124	0.213	0.090	0.034
5	1.522	7.525	1.008	0.514	0.373	0.097	0.267	0.069	0.033
10	1.236	11.735	0.475	0.761	0.746	0.079	0.416	0.030	0.048
20	1.446	21.356	0.324	1.122	1.492	0.092	0.759	0.021	0.071
50	2.411	not det.	0.1088	2.302	3.730	0.153	not det.	0.007	0.146
100	4.702	"	0.000	4.702	7.460	0.299	"	0.000	0.299
200	9.485	"	0.000	9.485	14.920	0.603	"	0.000	0.603
1000	97.0	"	0.000	97.0	74.60	6.170	"	0.000	6.170
2000	384.0	"	0.000	384.0	149.2	24.42	"	0.000	24.420

**SOLUBILITY OF COPPER CHLORIDE IN AQUEOUS SOLUTIONS OF SODIUM  
CHLORIDE.**

(Hunt — Am. J. Sci. [2] 49, 154, '70.)

t°.	Grams $\text{CuCl}_2$ per 100 cc. Solution of:		
	Sat. NaCl.	15% NaCl.	5% NaCl.
11	8.9	3.6	...
40	11.9	6.0	1.1
90	16.9	10.3	2.6

**SOLUBILITY OF COPPER CHLORIDE AND POTASSIUM CHLORIDE DOUBLE  
SALTS AND MIXTURES IN WATER.**

(Meyerhoffer — Z. physik. Chem. 5, 102, '90.)

t°.	Cl per 1 Gram Solution.		Mols. per 100 Mols. H <sub>2</sub> O.		Solid Phase.
	Present as CuCl <sub>2</sub> .	Present as KCl.	CuCl <sub>2</sub> .	KCl.	
39.4	0.120	0.107	5.56	9.93	CuCl <sub>2</sub> ·2KCl·2H <sub>2</sub> O + KCl
49.9	0.129	0.115	6.39	11.4	"
60.4	0.142	0.125	7.71	13.6	"
79.1	0.168	0.142	11.1	18.8	"
90.5	0.188	0.154	14.9	24.4	"
93.7	0.194	0.156	16.2	26.0	CuCl <sub>2</sub> ·KCl + KCl
98.8	0.197	0.162	17.5	28.7	"
0	0.214	0.021	9.84	1.94	CuCl <sub>2</sub> ·2KCl·2H <sub>2</sub> O + CuCl <sub>2</sub> ·2H <sub>2</sub> O
39.6	0.232	0.049	12.9	5.44	"
50.1	0.233	0.059	13.7	6.90	"
52.9	0.241	0.062	14.8	7.63	"
60.2	0.246	0.066	15.8	8.49	CuCl <sub>2</sub> ·KCl + CuCl <sub>2</sub> ·2H <sub>2</sub> O
72.6	0.255	0.063	16.8	8.35	"
64.2	...	...	14.9	11.6	CuCl <sub>2</sub> ·2KCl·2H <sub>2</sub> O + CuCl <sub>2</sub> ·KCl
72.5	...	...	14.8	15.0	CuCl <sub>2</sub> ·KCl

**SOLUBILITY OF CUPRIC CHLORIDE IN SEVERAL SOLVENTS.**

(Etard — Ann. chim. phys. [7] 2, 564, '94; de Bruyn — Z. physik. Chem. 10, 783, '92; de Coninck — Compt. rend. 131, 59, '00; St. von Laszczynski — Ber. 27, 2285, '94.)

Solvent.	Grams CuCl <sub>2</sub> per 100 Grams Sat. Solution at:				
	0°.	15°.	20°.	40°.	80°.
Methyl Alcohol	36	40.5 (de B.)	36.5	37.0	...
Ethyl Alcohol	32	35.0 (de B.)	35.7	39.0	...
Propyl Alcohol	29	...	30.5	30.5	...
Iso Propyl Alcohol	...	...	...	16.0	30.0
n Butyl Alcohol	15	...	15.3	16.0	16.5
Allyl Alcohol	23	...	23.0	...	...
Ethyl Formate	10	...	9.0	8.0	...
Ethyl Acetate	...	...	3.0	2.5	1.3 (72°)
Acetone (abs.)	8.86*	8.92†	2.88 (18°)	...	1.40 (56°)
Acetone (80%)	...	...	18.9‡	...	...
Ether	...	0.043 (11°)	0.11	...	...

\* (CuCl<sub>2</sub>·2 Aq.)

† (CuCl<sub>2</sub>·2 Aq.)

‡ (23° CuCl<sub>2</sub>·2 Aq.)

For the solubility of cupric chloride in mixtures of a number of organic solvents, see de Coninck.

## COPPER CHLORIDE

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### SOLUBILITY OF CUPRIC CHLORIDE IN AQUEOUS ALCOHOL AT 11.5°.

(Böttker — Z. physik. Chem. 22, 507, '97.)

10 gms. of  $\text{CuCl}_2 \cdot 2\text{H}_2\text{O}$  and the indicated amounts of  $\text{CuCl}_2$  were added to 20 cc. portions of alcohol. The solutions shaken two hours, 5 cc. portions withdrawn.

Vol. % Alcohol.	Gms. $\text{CuCl}_2$ Added.	Gms. per 5 cc. Solution. $\text{H}_2\text{O}$ .	$\text{CuCl}_2$ .	Vol. % Alcohol.	Gms. $\text{CuCl}_2$ Added.	Gms. per 5 cc. Solution. $\text{H}_2\text{O}$ .	$\text{CuCl}_2$ .
89.3	0.0	0.794	1.137	99.3	0.223	0.330	1.295
92.0	0.0	0.648	1.090	99.3	0.887	0.247	1.639
96.3	0.0	0.478	1.116	99.3	1.540	0.191	2.086
99.3	0.0	0.369	1.208	99.3	1.957	0.164	2.400

## COPPER NITRATE (ic) $\text{Cu}(\text{NO}_3)_2$ .

### SOLUBILITY IN WATER.

(Funk — Wiss. Abh. p. t. Reichanstalt, 3, 440, '00.)

t°.	Gms. $\text{Cu}(\text{NO}_3)_2$ per 100 Gms. Solution.	Mols. $\text{Cu}(\text{NO}_3)_2$ per 100 Mols. $\text{H}_2\text{O}$ .	Solid Phase.	t°.	Gms. $\text{Cu}(\text{NO}_3)_2$ per 100 Gms. Solution.	Mols. $\text{Cu}(\text{NO}_3)_2$ per 100 Mols. $\text{H}_2\text{O}$ .	Solid Phase.
-23	36.08	5.42	$\text{Cu}(\text{NO}_3)_2 \cdot 9\text{H}_2\text{O}$	20	55.58	12.0	$\text{Cu}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$
-20	40.92	6.65	"	26.4	63.39	16.7	"
-21	39.52	6.27	$\text{Cu}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$	25	60.01	14.4	$\text{Cu}(\text{NO}_3)_2 \cdot 3\text{H}_2\text{O}$
0	45.00	7.87	"	40	61.51	15.2	"
+10	48.79	9.15	"	60	64.17	17.2	"
18	53.86	11.20	"	80	67.51	20.0	"
				114.5	77.59	33.3	"

Density of solution saturated at 18° = 1.681.

## COPPER SULPHATE $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ .

### SOLUBILITY IN WATER.

(Etard — Ann. chim. phys. [7] 2, 528, '94; Patrick and Aubert — Trans. Kansas Acad. Sci. 19, '74; at 15°, Cohen — Z. Electrochem. 9, 433, '03; at 25°, Trevor — Z. physik. Chem. 7, 470, '91.)

t°.	Gms. $\text{CuSO}_4$ per 100 Gms. Solution.	Water.	t°.	Gms. $\text{CuSO}_4$ per 100 Gms. Solution.	Water.
0	12.5	14.3	60	28.5	40.0
10	14.8	17.4	80	35.5	55.0
20	17.2	20.7	100	43.0	75.4
25	18.5	22.7	120	44.0	78.6
30	20.0	25.0	140	44.5	80.2
40	22.5	28.5	160	44.0	78.6
50	25.0	33.3	180	43.0	75.4

### SOLUBILITY OF COPPER SULPHATE IN AQUEOUS SOLUTIONS OF SULPHURIC ACID AT 0°.

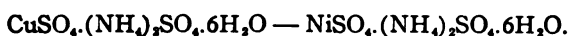
(Engel — Compt. rend. 104, 507, '87.)

Milligram Equiv. per 10 Gms. $\text{H}_2\text{O}$ .		Sp. Gr. of Solutions.	Grams per 100 Grams $\text{H}_2\text{O}$ .	
$\text{H}_2\text{SO}_4$ .	$\text{CuSO}_4$ .		$\text{H}_2\text{SO}_4$ .	$\text{CuSO}_4$ .
0.0	18.6	1.144	0.00	14.85
4.14	17.9	1.143	2.03	14.29
14.6	19.6	1.158	7.16	15.65
31.0	12.4	1.170	15.20	9.90
54.2	8.06	1.195	26.57	6.43
56.25	7.75	1.211	27.57	6.19
71.8	5.0	1.224	35.2	3.99

**SOLUBILITY OF COPPER SULPHATE IN AQUEOUS SOLUTIONS OF AMMONIUM SULPHATE AT 0°.**  
(Engel — Compt. rend. 102, 114, '86.)

Milligram Equiv. per 10 cc. Solution.		Sp. Gr. of Solutions.	Grams per 100 cc. Solution.	
(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub> .	CuSO <sub>4</sub> .		(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub> .	CuSO <sub>4</sub> .
0.0	18.52	1.144	0.0	14.79
5.45	20.15	1.190	3.61	16.09
7.0	10.5	1.108	4.63	8.38
7.4	9.1	1.099	4.90	7.26
8.45	6.425	1.0815	5.59	5.13
11.35	3.7	1.071	7.51	2.95
18.6	1.178	1.082	12.31	0.94
31.2	1.0	1.116	20.65	0.80

**MIXTURES OF COPPER AMMONIUM SULPHATE AND NICKEL AMMONIUM SULPHATE IN WATER AT 13°-14°.**  
(Fock — Z. Kryst. Min. 28, 394, '97.)



Mol. % in Solution.		Mols. per 100 Mols. H <sub>2</sub> O.		Mol. % in Solid Phase.	
Cu. Salt.	Ni Salt.	Cu Salt.	Ni Salt.	Cu. Salt.	Ni Salt.
0.00	100.00	0.00	0.521	0.00	100.00
33.34	66.66	0.1476	0.295	10.29	89.71
56.05	43.95	0.2664	0.2089	30.59	69.41
73.89	26.20	0.4165	0.1449	52.23	47.77
79.92	20.08	0.4785	0.1202	78.80	21.20
100.00	0.00	1.0350	0.00	100.0	0.00

**MIXTURES OF COPPER AMMONIUM SULPHATE AND ZINC AMMONIUM SULPHATE IN WATER AT 13°-14°.**  
(Fock.)



Mol. % in Solution.		Mols. per 100 Mols. H <sub>2</sub> O.		Mol. % in Solid Phase.	
Cu. Salt.	Zn Salt.	Cu Salt.	Zn Salt.	Cu. Salt.	Zn Salt.
4.97	95.03	0.0422	0.8069	2.39	97.61
10.65	89.35	0.0666	0.5638	4.52	95.48
19.24	80.76	0.1218	0.5115	9.03	90.97
30.19	69.81	0.2130	0.4924	14.67	85.33
44.44	55.56	0.3216	0.4022	22.62	77.38
100.00	0.00	1.035	0.000	100	0.000

**SOLUBILITY OF COPPER SULPHATE IN AQUEOUS SOLUTIONS OF MAGNESIUM SULPHATE AT 0°.**  
(Diacon — Jahresber. Chem. 61, '66.)

Grams per 100 Gms. H <sub>2</sub> O.		Solid Phase.	Grams per 100 Gms. H <sub>2</sub> O.		Solid Phase.
CuSO <sub>4</sub> .	MgSO <sub>4</sub> .		CuSO <sub>4</sub> .	MgSO <sub>4</sub> .	
0	26.37	MgSO <sub>4</sub> ·6H <sub>2</sub> O	12.03	15.67	CuSO <sub>4</sub> ·H <sub>2</sub> O
2.64	25.91	"	13.61	8.64	"
4.75	25.30	"	14.99	0.00	"
9.01	23.30	MgSO <sub>4</sub> ·6H <sub>2</sub> O + CuSO <sub>4</sub> ·5H <sub>2</sub> O			

## COPPER SULPHATE

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## COPPER SULPHATE, MANGANESE SULPHATE, MIXED CRYSTALS AT 25°.

(Stortenbecker — Z. physik. Chem. 34, 112, '00.)

Gms. per 100 Gms. H <sub>2</sub> O.		Mols. per 100 Mols. H <sub>2</sub> O.		Mol. % Cu in Solution.	Mol. % Cu in Crystals.
CuSO <sub>4</sub> .	MnSO <sub>4</sub> .	Cu.	Mn.		
Triclinic Crystals with 5H <sub>2</sub> O.					
20.2	0	2.282	0	100	100
				90.5	99.3
19.76	3.69	2.23	0.44	83.5	...
				74.1	97.3
				57.7	95.1
				31.0	81.3
13.65	31.52	1.54	3.76	29.0	...
				26.1	70.4
11.61	39.41	1.31	4.70	21.8	...
				21.2	42.6
				20.0	34.4
9.39	46.77	1.06	5.59	15.9	22.9
				13.45*	15.2*
6.47	53.39	0.73	6.37	10.27	10.5
				5.0	4.9
3.01	58.93	0.34	7.03	4.6	...
				2.31	2.15
0.0	61.83	0.0	7.375	0.0	100.0
Monoclinic Crystals with 7H <sub>2</sub> O.					
				20.0	28.2
9.39	46.77	1.06	5.58	15.9	23.5
				13.45	20.8
6.47	53.39	0.73	6.37	10.27	16.0
				4.6*	5.8*
0.0	67.07±	0.0	8±*	0.0	100

\* Indicates points of labil equilibrium.

## COPPER SULPHATE, ZINC SULPHATE, MIXED CRYSTALS IN WATER.

(Stortenbecker — Z. physik. Chem. 22, 62, '97.)

Mols. per 100 Mols. H <sub>2</sub> O.		Mol. % Cu in Solution.	Mol. % Cu in Crystals.	
Cu.	Zn.			
2.28	0	100	100	Triclinic Crystals with 5H <sub>2</sub> O.
1.83	2.08	46.8	94.9	
1.41	3.60	28.1	86.4	
1.19	5.01	19.2	77.9	
1.86	3.36	36.2	40.4	
1.22	4.45	21.5	29.5-31.9	Monoclinic Crystals with 7H <sub>2</sub> O.
1.01	4.72	17.6	24.1-28.	
0.82	5.03	14.0	19.0-22.	
0.51	5.59	8.36	12.4-14.9	
0.30	5.56	4.87	7.02	
0.0	6.42	0.0	0	Rhombic Crystals with 7H <sub>2</sub> O.
1.19	5.01	19.2	5.01	
0.51	5.59	8.36	1.97	
0.267	5.77	4.42	1.15	
0.0	5.94	0.0	0.00	

# SOLUBILITY OF COPPER SULPHATE, SODIUM SULPHATE MIXTURES IN WATER.

(Koppel — Z. physik. Chem. 42, 8, '01-'02; Massol and Malmes — Compt. rend. 133, 287, '01.)

t°.	Gms. per 100 Gms. Solution.		Mols. per 100 Mols. H <sub>2</sub> O.		Solid Phase.
	CuSO <sub>4</sub> .	Na <sub>2</sub> SO <sub>4</sub> .	CuSO <sub>4</sub> .	Na <sub>2</sub> SO <sub>4</sub> .	
0	13.40	6.23	1.88	0.98	CuSO <sub>4</sub> .5H <sub>2</sub> O + Na <sub>2</sub> SO <sub>4</sub> .10H <sub>2</sub> O
10	14.90	9.46	2.23	1.56	"
15	15.18	11.64	2.23	2.02	"
17.7	14.34	13.34	2.24	2.34	CuSO <sub>4</sub> .Na <sub>2</sub> SO <sub>4</sub> .6H <sub>2</sub> O
23.0	14.36	12.76	2.23	2.21	"
40.15	13.73	12.26	2.10	2.10	"
17.7	14.99	13.48	2.37	2.39	CuSO <sub>4</sub> .Na <sub>2</sub> SO <sub>4</sub> .6H <sub>2</sub> O + CuSO <sub>4</sub> .5H <sub>2</sub> O
23	16.41	11.35	2.57	1.99	"
40.15	20.56	8.0	3.25	1.47	"
18	13.53	13.84	2.10	2.41	CuSO <sub>4</sub> .Na <sub>2</sub> SO <sub>4</sub> .6H <sub>2</sub> O + Na <sub>2</sub> SO <sub>4</sub> .10H <sub>2</sub> O
20	11.34	15.70	1.76	2.73	"
25	6.28	21.20	0.98	3.70	"
30	2.607	28.38	0.43	5.21	"
33.9	1.475	32.30	0.25	6.18	"
37.2	1.494	31.96	0.25	6.08	"
30	5.38	22.17	} CuSO <sub>4</sub> .Na <sub>2</sub> SO <sub>4</sub> .6H <sub>2</sub> O + increasing amts. of Na <sub>2</sub> SO <sub>4</sub> .10H <sub>2</sub> O		
30.1	3.69	25.37			
30	1.57	32.09			

# SOLUBILITY OF COPPER POTASSIUM SULPHATE CuK<sub>2</sub>(SO<sub>4</sub>)<sub>2</sub>.6H<sub>2</sub>O in WATER AT 25°.

100 gms. H<sub>2</sub>O dissolve 11.14 gms. CuK<sub>2</sub>(SO<sub>4</sub>)<sub>2</sub>.

(Trevor — Z. physik. Chem. 7, 470, '91.)

# SOLUBILITY OF COPPER SULPHATE IN METHYL AND ETHYL ALCOHOL, ETC.

(de Bruyn — Z. physik. Chem. 10, 786, '92; de Coninck — Bull. acad. roy. Belgique, 257, '05.)

Solvent.	t°.	Gms. per 100 Gms. Solvent.		SOLUBILITY IN AQUEOUS ALCOHOL AT 15°.	
		CuSO <sub>4</sub> .	CuSO <sub>4</sub> .5H <sub>2</sub> O.		
Methyl Alcohol Abs.	18	1.05	15.6	(Schiff — Liebig's Ann. 118, 365, '61.)	
"	93.5%	18	...	0.93	
"	50%	18	...	0.40	
"	Abs.	3	...	13.4	
Ethyl Alcohol Abs.	3	...	1.1	10	15.3
Glycol	14.6	...	7.6*	20	3.2
Glycerine	15.5	...	30.0	40	0.25

\* Per 100 g. sol.

# COPPER SULPHIDE CuS.

## SOLUBILITY IN AQUEOUS SUGAR SOLUTIONS.

(Stolle — Z. Ver. Zuckerind. 50, 340, '00.)

% Sugar in Solvent.	Gms. CuS per Liter of Aq. Sugar Solution at:		
	17.5°.	45°.	75°.
10	0.5672	0.3659	1.1345
30	0.8632	0.7220	1.2033
50	0.9076	1.0589	1.2809

**COPPER TARTRATE**

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**COPPER TARTRATE**  $\text{CuC}_4\text{O}_6\text{H}_4\cdot 3\text{H}_2\text{O}$ .**SOLUBILITY IN WATER.**

(Cantoni and Zachoder — Bull. soc. chim. [3] 33, 751, '05.)

t°.	Gms. $\text{CuC}_4\text{O}_6\text{H}_4\cdot 3\text{H}_2\text{O}$ per 100 cc. Solution.	t°.	Gms. $\text{CuC}_4\text{O}_6\text{H}_4\cdot 3\text{H}_2\text{O}$ per 100 cc. Solution.	t°.	Gms. $\text{CuC}_4\text{O}_6\text{H}_4\cdot 3\text{H}_2\text{O}$ per 100 cc. Solution.
15	0.0197	40	0.1420	65	0.1767
20	0.0420	45	0.1708	70	0.1640
25	0.0690	50	0.1920	75	0.1566
30	0.0890	55	0.2124	80	0.1440
35	0.1205	60	0.1970	85	0.1370

**CRESOL**  $\text{C}_6\text{H}_4(\text{OH})\cdot\text{CH}_3$ , *o*, *m* and *p*.**SOLUBILITY IN WATER AT 20°.**

(Vaubel — J. pr. Chem. [2] 52, 72, '95.)

100 grams of the saturated aqueous solution contain :

2.45 grams *o* cresol, 2.18 grams *m* cresol, 1.94 grams *p* cresol.**DISTRIBUTION OF CRESOL BETWEEN WATER AND ETHER.**

(Vaubel — J. pr. Chem. [2] 67, 472, '03.)

Composition of Solvent.	Gms. Cresol in $\text{H}_2\text{O}$ Layer.	In Ether Layer.
200 cc. $\text{H}_2\text{O}$ + 100 cc. Ether	0.0570	1.0760
200 cc. $\text{H}_2\text{O}$ + 200 cc. Ether	0.0190	1.1144

**CUMINIC ACID**  $\text{C}_6\text{H}_5\text{C}_2\text{H}_4\cdot\text{COOH}$  (*p* Iso Propyl Benzoic Acid).**SOLUBILITY IN WATER AT 25°.**

(Paul — Z. physik. Chem. 14, 111, '94.)

1000 cc. sat. solution contain 0.1519 gm. or 0.926 millimol Cuminic Acid.

**PseudoCUMIDINE**  $(\text{CH}_3)_3\text{C}_6\text{H}_2\cdot\text{NH}_2$  (*sym.* 5 Amino, 1, 2, 4, Trimethyl benzene).**SOLUBILITY IN WATER.**

(Lowenherz — Z. physik. Ch. 25, 412, '98.)

t°.	10.4°.	23.7°.	28.7°.
Gms. $\psi$ Cumidine per liter $\text{H}_2\text{O}$	1.198	1.330	1.498

**CYANOGEN**  $\text{CN}$ .**SOLUBILITY IN SEVERAL SOLVENTS AT 20°.**

(Gay Lussac.)

Solvent.	Vols. $\text{CN}$ per 1 Vol. Solvent.
Water	4.5
Alcohol	23.0
Ether	5.0
Oil of Turpentine	5.0

**DIDYMIUM SULPHATE**  $\text{Di}_2(\text{SO}_4)_3$ .**SOLUBILITY IN WATER.**

(Marignac — Ann. chim. phys. [3] 38, 170, '53.)

t°.	Gms. $\text{Di}_2(\text{SO}_4)_3$ per 100 Gms. $\text{H}_2\text{O}$ .	Solid Phase.	t°.	Gms. $\text{Di}_2(\text{SO}_4)_3$ per 100 Gms. $\text{H}_2\text{O}$ .	Solid Phase.
12	43.1	$\text{Di}_2(\text{SO}_4)_3$	?	34.0	$\text{Di}_2(\text{SO}_4)_3 \cdot 6\text{H}_2\text{O}$
18	25.8	"	19	11.7	$\text{Di}_2(\text{SO}_4)_3 \cdot 8\text{H}_2\text{O}$
25	20.6	"	40	8.8	"
38	13.0	"	50	6.5	"
50	11.0	"	100	1.8	"

**DIDYMIUM POTASSIUM SULPHATE**  $\text{K}_2\text{SO}_4 \cdot \text{Di}_2(\text{SO}_4)_3 \cdot 2\text{H}_2\text{O}$ .

(Marignac.)

100 gms.  $\text{H}_2\text{O}$  dissolve 1.6 grams double salt at 18°.**ERBIUM SULPHATE**  $\text{Er}_2(\text{SO}_4)_3$ .**SOLUBILITY IN WATER.**

(Hoglund.)

100 gms.  $\text{H}_2\text{O}$  dissolve 43.0 gms.  $\text{Er}_2(\text{SO}_4)_3$  at 0°.100 gms.  $\text{H}_2\text{O}$  dissolve 23.0 gms.  $\text{Er}_2(\text{SO}_4)_3 \cdot 8\text{H}_2\text{O}$  at 20°.**ERYTHRIT**  $\text{CH}_2\text{OH}(\text{CHOH})_2\text{CH}_2\text{OH}$ .

100 grams saturated solution in pyridine contain 250 gms. at 26°.

(Holtz — J. Physic. Chem. 9, 764, '05.)

**ETHANE**  $\text{C}_2\text{H}_6$ .**SOLUBILITY IN WATER.**

(Winkler — Ber. 34, 1421, '01.)

t°.	$\beta$ .	$\beta'$ .	q.	t°.	$\beta$ .	$\beta'$ .	q.
0	0.0987	0.0982	0.0132	40	0.0292	0.0271	0.0037
5	0.0803	0.0796	0.0107	50	0.0246	0.0216	0.0029
10	0.0656	0.0648	0.0087	60	0.0218	0.0175	0.0024
15	0.0550	0.0541	0.0073	70	0.0195	0.0135	0.0018
20	0.0472	0.0462	0.0062	80	0.0183	0.0097	0.0013
25	0.0410	0.0398	0.0054	90	0.0176	0.0054	0.0007
30	0.0362	0.0347	0.0049	100	0.0172	0.0000	0.0000

$\beta$  = Absorption coefficient, *i.e.*, the volume of gas (reduced to 0° and 760 mm.) absorbed by 1 volume of the liquid when the pressure of the gas itself without the tension of the liquid amounts to 760 mm.

$\beta'$  = Solubility, *i.e.*, the volume of gas (reduced to 0° and 760 mm.) which is absorbed by one volume of the liquid when the barometer indicates 760 mm. pressure.

q = the weight of gas in grams which is taken up by 100 grams of the pure solvent at the indicated temperature and a total pressure (that is, the partial pressure of the gas plus the vapor pressure of the liquid at the absorption temperature) of 760 mm.



ETHER ( $C_2H_5$ )<sub>2</sub>O.

## RECIPROCAL SOLUBILITY OF ETHER AND WATER.

(Klobbie — Z. physik. Chem. 24, 619, '97; Schuncke — *Ibid.* 14, 334, '94; St. Tolloczko — *Ibid.* 20, 407, '96.)

Solubility of Ether in Water. Lower Layer — Aqueous.			Solubility of Water in Ether. Upper Layer — Ethereal.	
t°.	Gms. (C <sub>2</sub> H <sub>5</sub> ) <sub>2</sub> O per 100 Gms.		Gms. H <sub>2</sub> O per 100 Gms.	
	Water.	Solution.	Ether.	Solution.
0	13.12	11.6	1.01	1.0
5	11.4	10.2	1.06	1.05
10	9.5	8.7	1.12	1.12 (2.6, S.)
15	8.2	7.6	1.16	1.15
20	6.95	6.5	1.20	1.20 (2.65, S.)
25	6.05	5.7	1.26	1.26
30	5.4	5.1	1.33	1.32
*40	4.7	4.5	1.52	1.50
*50	4.3	4.1	1.73	1.7
*60	3.8	3.7	1.83	1.8
*70	3.3	3.2	2.04	2.0
*80	2.9	2.8	2.25	2.2

\* Indicates determinations made by Synthetic Method, for which see page 9.

100 cc. H<sub>2</sub>O dissolve 8.11 cc. ether at 22°; Vol. of solution 107.145 cc., Sp. Gr. 0.9853.100 cc. ether dissolve 2.93 cc. H<sub>2</sub>O at 22°; Vol. of solution 103.282, Sp. Gr. 0.7164. (Herz — Ber. 31, 2671, '98.)

For recent determinations of the density of ether, see Christomanos — Z. anorg. Chem. 45, 136, '05.

## SOLUBILITY OF ETHER IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID.

(Schuncke — Z. physik. Chem. 14, 334, '94; in 38.52% HCl, Draper — Chem. News, 35, 87, '77.)

In 38.52 % HCl.			In 31.61 % HCl.			In 20 % HCl.		
t°.	cc. Ether per 100 cc. Solvent.	cc. Ether per 100 cc. Solvent.	Gms. per 1 Gram H <sub>2</sub> O.		cc. Ether per 100 cc. Solvent.	Gms. per 1 g. H <sub>2</sub> O.		cc. Ether per 100 cc. Solvent.
			HCl.	(C <sub>2</sub> H <sub>5</sub> ) <sub>2</sub> O.		HCl.	(C <sub>2</sub> H <sub>5</sub> ) <sub>2</sub> O.	
-6	181	149	0.4622	1.387	67.2	0.253	0.5637	
0	177.5	142	0.4622	1.308	58.3	0.253	0.4863	
+6	172.5	131.5	0.4622	1.2075	51.1	0.253	0.4231	
15	163	121.7 (14°)	0.4622	1.1075	40.5	0.253	0.3299	
20	158	116.9 (20.8°)	0.4622	1.0005	33.1	0.253	0.2688	
26	135	104.2	0.4622	0.9360	27.5	0.253	0.2221	

In 12.58 % HCl.			In 3.65 % HCl.		
t°.	cc. Ether per 100 cc. Solvent.	Gms. per 1 Gram H <sub>2</sub> O.	cc. Ether per 100 cc. Solvent.	Gms. per 1 Gram H <sub>2</sub> O.	cc. Ether per 100 cc. Solvent.
		HCl. (C <sub>2</sub> H <sub>5</sub> ) <sub>2</sub> O.		HCl. (C <sub>2</sub> H <sub>5</sub> ) <sub>2</sub> O.	
-6	26.45	0.144 0.2106	19.23	0.0308 0.1454	
0	22.19	0.144 0.1748	...	...	
+6	19.18	0.144 0.1503	14.31	0.0308 0.1070	
15	15.61	0.144 0.1210	11.83	0.0308 0.0868	
20	13.76	0.144 0.1059	10.52	0.0308 0.0769	
26	12.70	0.144 0.0970	9.24	0.0308 0.0673	

## SOLUBILITY OF ETHER IN AQUEOUS SALT, ETC., SOLUTIONS AT 18°.

(Euler — Z. physik. Chem. 49, 306, '04.)

Aq. Solution of:	Gms. per Liter Added Salt.	Gms. (C <sub>2</sub> H <sub>5</sub> ) <sub>2</sub> O per 100 cc. Solvent.	Aq. Solution of:	Gms. per Liter Added Salt.	Gms. (C <sub>2</sub> H <sub>5</sub> ) <sub>2</sub> O per 100 cc. Solvent.
Water	0.0	7.8	Na <sub>2</sub> SO <sub>4</sub>	59.54	3.7
KNO <sub>3</sub>	101.19	5.4	Mannite	91.06	6.7
KCl	73.6	4.7	H <sub>2</sub> SO <sub>4</sub>	49.0	6.6
LiCl	42.48	5.2	"	122.5	5.65
NaCl	58.5	4.5	"	245.0	4.55

## SOLUBILITY OF ETHER IN AQUEOUS ETHYL ALCOHOL AND IN AQUEOUS METHYL ALCOHOL MIXTURES AT 20°.

(Bancroft — Phys. Rev. 3, 122, '95-'96.)

## In Ethyl Alcohol.

## In Methyl Alcohol.

Per 5 cc. Alcohol.		Per 5 cc. Alcohol.		Per 1 cc. CH <sub>3</sub> OH.		Per 1 cc. CH <sub>3</sub> OH.	
cc. H <sub>2</sub> O.*	cc. (C <sub>2</sub> H <sub>5</sub> ) <sub>2</sub> O.†	cc. H <sub>2</sub> O.*	cc. (C <sub>2</sub> H <sub>5</sub> ) <sub>2</sub> O.†	cc. H <sub>2</sub> O.	cc. (C <sub>2</sub> H <sub>5</sub> ) <sub>2</sub> O.	cc. H <sub>2</sub> O.	cc. (C <sub>2</sub> H <sub>5</sub> ) <sub>2</sub> O.
50	1.30	4.45	7.0	10	1.13	0.83	1.80
25	1.70	4.0	7.8	7	0.85	0.64	3.00
10	2.41	3.87	8.0	4	0.60	0.52	5.0
8	3.35	3.10	10.0	2.5	0.56	0.44	10.0
6	5.10	2.08	15.0	1.8	0.63	0.45	15.0
5.21	6.00	1.77	17.5	1.0	1.23		

\* Saturated with ether.

† Saturated with water.

ETHYL ACETATE CH<sub>3</sub>COOC<sub>2</sub>H<sub>5</sub>.

## SOLUBILITY IN WATER AND IN AQUEOUS SALT SOLUTIONS AT 28°.

(Euler — Z. physik. Chem. 31, 365, '99; 49, 306, '04.)

Solvent.	Conc. of Salt Solution.		CH <sub>3</sub> COOC <sub>2</sub> H <sub>5</sub> per Liter.		Solvent.	Conc. of Salt Solution.		CH <sub>3</sub> COOC <sub>2</sub> H <sub>5</sub> per Liter.	
	Nor. mality.	Gms. per Liter.	Gram Mols.	Grams.		Nor. mality.	Gms. per Liter.	Gram Mols.	Grams.
Water	0	0	0.825	75.02	NaCl (at 18°)	$\frac{1}{2}$	14.62	0.76	67.0
KNO <sub>3</sub>	$\frac{1}{2}$	50.59	0.77	67.81	"	$\frac{1}{2}$	29.25	0.67	59.0
"	1	101.19	0.72	63.40	"	1	58.5	0.51	45.0
"	2	202.38	0.625	55.04	Na <sub>2</sub> SO <sub>4</sub>	1	71.08	0.465	40.96
KCl	$\frac{1}{2}$	18.4	0.747	65.79	" (at 18°)	$\frac{1}{2}$	35.54	0.61	54.0
"	$\frac{1}{2}$	36.8	0.685	65.33	"	1	71.08	0.42	37.0
"	1	73.6	0.575	50.64	MgSO <sub>4</sub>	$\frac{1}{2}$	16.30	0.733	64.55
"	2	147.2	0.41	36.11	"	$\frac{1}{2}$	32.6	0.655	57.68
NaCl	$\frac{1}{2}$	14.62	0.745	65.61	"	1	65.21	0.505	44.47
"	$\frac{1}{2}$	29.25	0.677	59.62	ZnSO <sub>4</sub>	$\frac{1}{2}$	20.18	0.733	64.55
"	1	58.5	0.545	47.99	"	$\frac{1}{2}$	40.36	0.653	57.50
"	2	117.0	0.315	27.74	"	1	80.73	0.500	44.03

# ETHYL ACETATE

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## SOLUBILITY OF ETHYL ACETATE IN AQUEOUS ETHYL ALCOHOL, METHYL ALCOHOL, AND ACETONE MIXTURES AT 20°.

(Bancroft—Phys. Rev. 3, 122, 131, '95-'96.)

In Ethyl Alcohol.		In Methyl Alcohol.		In Acetone.	
Per 1 cc. C <sub>2</sub> H <sub>5</sub> OH.		Per 1 cc. CH <sub>3</sub> OH.		Per 1 cc. (CH <sub>3</sub> ) <sub>2</sub> CO.	
cc. H <sub>2</sub> O.*	cc. CH <sub>3</sub> COOC <sub>2</sub> H <sub>5</sub> †	cc. H <sub>2</sub> O.	cc. CH <sub>3</sub> COOC <sub>2</sub> H <sub>5</sub> .	cc. H <sub>2</sub> O.	cc. CH <sub>3</sub> COOC <sub>2</sub> H <sub>5</sub> .
10	0.25	10	1.08	10	1.01
8	0.27	3	0.68	5	0.60
4	0.35	1.5	1.69	2	0.43
2	1.02	1.29	2.50	1.5	0.47
1.06	2.50	1.0	4.9	1.0	0.63
0.65	5.0	0.98	7.0	0.8	0.74
0.54	7.0	1.0	8.0	0.51	1.00
0.44	10.0	1.03	10.0	0.25	2.00
				0.29	5.00

\* Saturated with ethyl acetate.

† Saturated with water.

100 cc. H<sub>2</sub>O dissolve 7.26 g. ethyl acetate at 28°.

(Euler—Z. physik. Chem. 31, 360, '99.)

100 cc. H<sub>2</sub>O dissolve 9.26 cc. ethyl acetate at 20°.

100 cc. ethyl acetate dissolve 2.94 cc. water at 20°.

# ETHYL BUTYRATE C<sub>4</sub>H<sub>7</sub>COOC<sub>2</sub>H<sub>5</sub>.

## SOLUBILITY IN WATER AND IN AQUEOUS ETHYL ALCOHOL MIXTURES AT 20°.

100 g. H<sub>2</sub>O dissolve 0.5 g. ethyl butyrate at 22°.

(Traube—Ber. 17, 2304, '84.)

100 cc. H<sub>2</sub>O dissolve 0.8 cc. ethyl butyrate at 20°.

(Bancroft.)

100 cc. ethyl butyrate dissolve 0.4 — 0.5 cc. H<sub>2</sub>O at 20°.

Per 5 cc.	{	cc. H <sub>2</sub> O	10	6	4	2.96	2.10
Ethyl Alcohol	{	cc. C <sub>4</sub> H <sub>7</sub> COOC <sub>2</sub> H <sub>5</sub>	0.34	0.96	2.47	4.00	6.0

# ETHYL FORMATE HCOOC<sub>2</sub>H<sub>5</sub>.

100 grams water dissolve 10 grams ethyl formate at 22°.

(Traube.)

# ETHYL PROPIONATE C<sub>2</sub>H<sub>5</sub>COOC<sub>2</sub>H<sub>5</sub>.

## SOLUBILITY IN WATER AND IN AQUEOUS ETHYL ALCOHOL MIXTURES.

(Bancroft.)

100 grams H<sub>2</sub>O dissolve 1.7 grams ethyl propionate at 22°.

(Traube.)

cc. Alcohol in Mixture.	cc. H <sub>2</sub> O to cause separation of a second phase in mixtures of the given amounts of Alcohol and 3 cc. portions of Ethyl Propionate.
3	2.32
6	6.87
9	12.35
12	19.17
15	27.12
18	36.84
21	50.42
24	∞

**ETHYL VALERATE**  $C_4H_7COOC_2H_5$ .**ETHYL (Iso) VALERATE**  $(CH_3)_2CH.CH_2COOC_2H_5$ .SOLUBILITY OF EACH IN WATER AND IN AQUEOUS ALCOHOL  
MIXTURES AT 20°.

(Bancroft.)

100 cc. water dissolve 0.3 cc. ethyl valerate at 25°.

100 cc. water dissolve 0.2 cc. ethyl iso valerate at 20°.

100 cc. ethyl iso valerate dissolve 0.4+ cc. water at 20°.

Mixtures of Ethyl Alcohol, Ethyl Valerate and Water.				Mixtures of Ethyl Alcohol, Ethyl Iso Valerate and Water.	
cc. Alcohol.*	cc. H <sub>2</sub> O.†	cc. Alcohol.*	cc. H <sub>2</sub> O.†	Per 5 cc. Ethyl Alcohol.	
				cc. H <sub>2</sub> O.	cc. Ethyl Iso Valerate.
3	1.42	39	53.13	10	0.15
9	7.18	45	63.60	8	0.23
15	14.13	57	90.53	6	0.46
21	22.40	72	131.0	5	0.72
27	31.62	81	180.0	4	1.23
33	41.62				

\* cc. Alcohol in mixture.

† cc. H<sub>2</sub>O added to cause the separation of a second phase in mixtures of the given amounts of alcohol and 3 cc. portions of ethyl valerate.**Di ETHYL KETONE** (3 Pentanon)  $(C_2H_5)_2CO$ .

## SOLUBILITY IN WATER.

(Rothmund — Z. physik. Ch. 26, 433, '98)

Determinations made by Synthetic Method, see page 9.

t°.	Gms. Di Ethyl Ketone per 100 Gms.		t°.	Gms. Di Ethyl Ketone per 100 Gms.	
	Aq. Layer.	Ketone Layer.		Aq. Layer.	Ketone Layer.
20	4.60	...	100	3.68	93.10
40	3.43	97.42	120	4.05	90.18
60	3.08	96.18	140	4.76	87.01
80	3.20	94.92	160	6.10	83.33

**ETHYL BROMIDE**  $C_2H_5Br$ .

## SOLUBILITY IN ETHER.

(Parmentier — Compt. rend. 114, 1002, '92.)

t°.	-13°.	0.	12.	22.5.	32.
G. $C_2H_5Br$ per 100 gms. Ether	632	561	462	302	253

## SOLUBILITY OF ETHYL BROMIDE, ETC., IN WATER.

(Rex — Z. physik. Chem. 55, 355, '06.)

Dissolved Substance.	Grams per 100 Grams H <sub>2</sub> O at:			
	0°.	10°.	20°.	30°.
Ethyl Bromide	1.067	0.965	0.914	0.896
Ethyl Iodide	0.441	0.414	0.403	0.415
Ethylene Chloride	0.922	0.885	0.869	0.894
Ethylidene Chloride	0.656	0.595	0.550	0.540

## ETHYL CARBAMATE

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## ETHYL CARBAMATE $\text{CO}(\text{OC}_2\text{H}_5)_2\text{NH}_2$ . (See also Urethane, p. 347.)

### SOLUBILITY IN SEVERAL SOLVENTS AT 25°.

(U. S. P.)

Solvent.	Water.	Alcohol.	Ether.	Chloroform.	Glycerine.
Gms. $\text{CO}(\text{OC}_2\text{H}_5)_2\text{NH}_2$ per 100 gms. solvent	100+	166	100	77	33

## ETHYLENE $\text{C}_2\text{H}_4$ .

### SOLUBILITY IN WATER AND IN ALCOHOL.

(Bunsen and Carius; Winkler — Landolt and Börnstein, Tabellen, 3d ed. p. 604, '06.)

t°.	$\beta$ .	$\epsilon$ .	Solubility in Alcohol.	
0	0.226	0.0281	t°.	Vols. $\text{C}_2\text{H}_4$ per 100 Vols. Alcohol.
5	0.191	0.0237		
10	0.162	0.0200	0	359.5
15	0.139	0.0171	4	337.5
20	0.122	0.0150	10	308.6
25	0.108	0.0131	15	288.2
30	0.098	0.0118	20	271.3

For  $\beta$  and  $q$  see Ethane, page 133.

## SOLUBILITY OF ETHYLENE IN METHYL ALCOHOL AND IN ACETONE.

(Levi — Gazz. chim. ital. 31, II, 513, '01.)

Results in terms of the Ostwald Solubility Expression  $l$ . See p. 105.

t°.	In Methyl Alcohol.	In Acetone.	t°.	In Methyl Alcohol.	In Acetone.
0	3.3924	4.0652	30	1.8585	1.8680
10	2.8831	3.3580	40	1.3432	1.0852
20	2.3718	2.6278	50	0.8259	0.2772
25	2.1154	2.2500	60	0.3506	...

The formulas from which the above figures were calculated are:

$$\begin{aligned} \text{In Methyl Alcohol, } l &= 3.3924 - 0.05083 t - 0.00001 t^2. \\ \text{In Acetone, } l &= 4.0652 - 0.06946 t - 0.000126 t^2. \end{aligned}$$

## FATS.

### SOLUBILITY OF THE FATTY ACIDS OBTAINED FROM SEVERAL SOURCES IN ALCOHOL AND IN BENZENE.

(Dubois and Pade — Bull. soc. chim. [2] 44, '85.)

Crude Fatty Acid of:	Gms. Fat per 100 Gms. Abs. Alcohol at:			Gms. Fats per 100 Gms. Benzene at 12°.
	0°.	10°.	26°.	
Mutton	2.48	5.02	67.96	14.70
Beef	2.51	6.05	82.23	15.89
Veal	5.00	13.78	137.10	26.08
Pork	5.63	11.23	118.98	27.30
Butter	10.61	24.81	158.2	69.61
Margarine	2.37	4.94	47.06	13.53

**FUMARIC ACID**  $\text{COOH} \cdot \text{CH} : \text{CH} \cdot \text{COOH}$ .

**MALËIC ACID**  $(\text{CH})_2(\text{COOH})_2$ .

**SOLUBILITY IN WATER.**

(Vaubel — J. pr. Chem. [2] 59, 30, '99.)

100 gms. water dissolve 0.672 gram fumaric acid at  $165^\circ$ .  
100 gms. water dissolve 50.0 grams malëic acid at  $100^\circ$ .

**FURFURAL**  $\text{C}_4\text{H}_4\text{OCHO}$ .

**SOLUBILITY IN WATER.**

(Rothmund — Z. physik. Chem. 26, 475, '98.)

Determinations by Synthetic Method, for which see page 9.

t°.	Gms. $\text{C}_4\text{H}_4\text{OCHO}$ per 100 Gms.		t°.	Gms. $\text{C}_4\text{H}_4\text{OCHO}$ per 100 Gms.	
	Aq. Layer.	Furfural Layer.		Aq. Layer.	Furfural Layer.
40	8.2	93.7	100	18.9	83.5
50	8.6	93.0	110	24.0	78.5
60	9.2	92.0	115	28.0	74.6
70	10.8	90.7	120	34.4	68.1
80	13.0	89.0	122.7 (crit. t.)	51.0	
90	15.5	86.6			

**GADOLINIUM SULPHATE**  $\text{Gd}_2(\text{SO}_4)_3 \cdot 8\text{H}_2\text{O}$ .

**SOLUBILITY IN WATER.**

(Benedicks — Z. anorg. Chem. 22, 409, '00.)

t°.	Gms. $\text{Gd}_2(\text{SO}_4)_3$ per 100 Gms $\text{H}_2\text{O}$ .	Solid Phase.	
		$\text{Gd}_2(\text{SO}_4)_3 \cdot 8\text{H}_2\text{O}$	
0	3.98	"	
10	3.3	"	
14	2.8	"	
25	2.4	"	
34.4	2.26	"	

**GALACTOSE**  $\text{C}_6\text{H}_{12}\text{O}_6$ .

100 grams saturated solution in pyridine contain 5.45 grams  $\text{C}_6\text{H}_{12}\text{O}_6$  at  $26^\circ$ , density of solution 1.0065.

(Holty — J. Physic. Chem. 9, 764, '05)

**GALLIC ACID**  $\text{C}_6\text{H}_2(\text{OH})_3(3, 4, 5) \text{COOH} + \text{H}_2\text{O}$ .

**SOLUBILITY IN SEVERAL SOLVENTS.**

(U. S. P.; Bourgoin — Ann. chim. phys. [5] 13, 406, '78.)

Solvent.	t°.	Gms. $\text{C}_7\text{H}_6\text{O}_5 \cdot \text{H}_2\text{O}$ per 100 Gms.	
		Solvent.	Solution.
Water	25	1.20	1.18
Water	100	33.3	25.0
Alcohol (Abs.)	...	23.3	18.1
Alcohol (U.S.P.)	25	24.1	19.3
Alcohol 90%	...	38.8	18.9
Ether	25	2.56	2.50
Glycerine	25	8.3	7.66

**GERMANIUM DIOXIDE** 140**GERMANIUM DIOXIDE**  $\text{GeO}_2$ .

100 gms.  $\text{H}_2\text{O}$  dissolve 0.405 gm.  $\text{GeO}_2$  at  $20^\circ$ , and 1.07 gms. at  $100^\circ$ .

(Winkler — J. pr. Chem. [2] 34, 177, '86; 36, 177, '87.)

**GERMANIUM** (Mono) **SULPHIDE**  $\text{GeS}$  and **GERMANIUM** (Di) **SULPHIDE**  $\text{GeS}_2$ .

100 gms.  $\text{H}_2\text{O}$  dissolve 0.24  $\text{GeS}$  and 0.45 gm.  $\text{GeS}_2$ .

(Winkler.)

**GLASS.**

For data on the solubility of glass in water and other solvents, see:

(Cowper — J. Chem. Soc. 41, 254, '82; Emmerling — Liebig's Annalen, 150, 257, '69; Böhling — Z. anal. Chem. 23, 518, '84; Kreusler and Herzhold — Ber. 17, 34, '84; Kohlrausch — Ber. 24, 3561, '91; Wied. Ann. 44, 577, '91; Förster — Ber. 25, '92; Mylius and Förster — Ber. 22, 1100, '89; Ber. 25, 70, '92; Wartha — Z. anal. Chem. 24, 220, '85, etc.)

**GLYCOLIC ACID**  $\text{CH}_2\text{OH}.\text{COOH}$ .

**SOLUBILITY IN WATER.**  
(Emich — Monatsb. Chem. 3, 336, '84.)

$t^\circ$ .	$20^\circ$ .	$60^\circ$ .	$80^\circ$ .	$100^\circ$ .
Gms. $\text{CH}_2\text{OH}(\text{COOH})$ per 100 gms. $\text{H}_2\text{O}$	0.033	0.102	0.235	0.850

**GLUCINIUM SALTS.** (See also Beryllium p. 63).**SOLUBILITY IN WATER AND IN ACETIC ACID SOLUTIONS.**

(Marignac; Sestini — Gazz. chim. ital. 20, 313, '90.)

Salt.	Formula.	Solvent.	Gms. Anhydrous Salt per 100 Gms. Solvent.	
			At $20^\circ$ .	At $100^\circ$ .
Glucinium potassium fluoride	$\text{GlF}_2.\text{KF}$	Water	2.0	5.2
“ sodium “	$\text{GlF}_2.\text{NaF}$	“	1.4	2.8
Glucinium hydroxide	$\text{Gl}(\text{OH})_2$	Water + $\text{CO}_2$ sat.	0.0185	( $\text{GlO}$ ) ...
“ phosphate	$\text{Gl}_2(\text{PO}_4)_2.6\text{H}_2\text{O}$	2% $\text{CH}_3\text{COOH}$	0.055	...
“ “	“	10% “	0.1725	...

**GLUTARIC ACID** (Pyrotartaric)  $(\text{CH}_2)_3(\text{COOH})_2$ .

**SOLUBILITY IN WATER.**  
(Lamouroux — Compt. rend. 128, 998, '99.)

$t^\circ$ .	$0^\circ$ .	$15^\circ$ .	$20^\circ$ .	$35^\circ$ .	$50^\circ$ .	$65^\circ$ .
Gms. $(\text{CH}_2)_3(\text{COOH})_2$ per 100 cc. solution	42.9	58.7	63.9	79.7	95.7	111.8

**GOLD** Au.**SOLUBILITY OF GOLD IN POTASSIUM CYANIDE SOLUTIONS.**

(Maclaurin — J. Chem. Soc. 63, 729, '03.)

Gold disks placed in Nestler tubes with KCN solutions.

Per cent KCN.	Grams Au Dissolved in 24 Hours in Nessler Tubes :			
	Full.	$\frac{1}{2}$ Full.	Oxygen Passed in.	Oxygen + Agitation.
0.1	0.00195	0.00331	...	...
1.0	0.00162	0.00418	0.00845	0.0187
5.0	0.0032	0.0046	0.01355	0.0472
20.0	0.0012	0.00305	0.0115	0.0314
50.0	0.00043	0.00026	0.00505	0.0108

**GOLD CHLORIDE** (Auric)  $\text{AuCl}_3$ .

## SOLUBILITY IN WATER, ETC.

100 gms.  $\text{H}_2\text{O}$  dissolve 68 grams  $\text{AuCl}_3$ .  
 $\text{AsCl}_3$  and  $\text{SbCl}_3$  each dissolve about 2.5%  $\text{AuCl}_3$  at  $15^\circ$ , and 22% at  $160^\circ$ .

$\text{SnCl}_4$  dissolves about 4%  $\text{AuCl}_3$  at  $160^\circ$ , and a trace at  $0^\circ$ .

(Lindet — Bull. soc. chim. [2] 45, 149, '86.)

**GOLD PHOSPHORUS TRI CHLORIDE** (Aurous)  $\text{AuCl}_2\text{PCl}_2$ .

100 gms.  $\text{PCl}_3$  dissolve 1 gram at  $15^\circ$ , and about 12.5 grams at  $120^\circ$ .

(Lindet — Compt. rend. 101, 1492, '85.)

**GOLD ALKALI DOUBLE CHLORIDES.**

SOLUBILITY OF SODIUM GOLD CHLORIDE, LITHIUM GOLD CHLORIDE, POTASSIUM GOLD CHLORIDE, RUBIDIUM GOLD CHLORIDE, AND CAESIUM GOLD CHLORIDE IN WATER.

(Rosenblatt — Ber. 19, 2537, '86.)

$t^\circ$ .	Grams Anhydrous Salt per 100 Grams Solution.				
	$\text{NaAuCl}_4$ .	$\text{LiAuCl}_4$ .	$\text{KAuCl}_4$ .	$\text{RbAuCl}_4$ .	$\text{CsAuCl}_4$ .
10	58.2	53.1	27.7	4.6	0.5
20	60.2	57.7	38.2	9.0	0.8
30	64.0	62.5	48.7	13.4	1.7
40	69.4	67.3	59.2	17.7	3.2
50	77.5	72.0	70.0	22.2	5.4
60	90.0	76.4	80.2	26.6	8.2
70	...	81.0	...	31.0	12.0
80	...	85.7	...	35.3	16.3
90	...	...	...	39.7	21.7
100	...	...	...	44.2	27.5

**GUAIACOL**  $\text{C}_8\text{H}_7(\text{OH})\text{OCH}_3$ , 1:2. **GUAIACOL CARBONATE**  $\text{C}_8\text{H}_7(\text{OCH}_2)_2\text{CO}_2$ .SOLUBILITY IN WATER, ALCOHOL, ETC.  
(U. S. P.)

Solvent.	$t^\circ$ .	Gms. per 100 Gms. Solvent.	
		Guaiacol.	Guaiacol Carbonate.
Water	25	1.89	...
Alcohol	25	...	2.08
Chloroform	25	...	66.6
Ether	25	...	7.69
Glycerine	25	100	...

**a Tri Phenyl GUANIDINE**  $\text{C}_6\text{H}_5\text{N}:\text{C}(\text{NHC}_6\text{H}_5)_2$ .SOLUBILITY IN MIXTURES OF ALCOHOL AND WATER AT  $25^\circ$ .

(Holleman and Antusch — Rec. trav. chim. 13, 292, '94.)

Vol. % Alcohol.	$\text{C}_6\text{H}_5\text{N}:\text{C}(\text{NHC}_6\text{H}_5)_2$ per 100 Gms. Solvent.	Gms. Density of Solutions.	Vol. % Alcohol.	$\text{C}_6\text{H}_5\text{N}:\text{C}(\text{NHC}_6\text{H}_5)_2$ per 100 Gms. Solvent.	Gms. Density of Solutions.
100	6.23	0.8021	80	1.06	0.8572
95	3.75	0.8158	75	0.67	0.8704
90	2.38	0.8309	70	0.48	0.8828
85	1.58	0.8433	60	0.22	0.9048



# HELIUM

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## HELIUM He.

SOLUBILITY IN WATER.  
(Estreicher — Z. physik. Chem. 31, 184, '99.)

t°.	Cor. Barometric Pressure.	Vol. of Water.	Vol. of He.	g.	Absorption Coefficient.	
					At Bar. Pressure Minus H <sub>2</sub> O Vapor Tension.	At 760 mm. Pressure.
0	...	...	...	0.000270	...	0.0150
0.5	764.0	73.584	1.093	...	0.0149	0.0149
5	758.0	73.578	1.062	0.000260	0.0144	0.0146
10	758.0	73.597	1.046	0.000255	0.0142	0.0144
15	757.8	73.641	1.008	0.000246	0.0137	0.0140
20	758.4	73.707	0.996	0.000242	0.0135	0.0139
25	762.3	73.793	0.983	0.000238	0.0133	0.0137
30	764.4	73.897	0.985	0.000238	0.0133	0.0138
35	764.5	74.0167	0.972	0.000234	0.0131	0.0138
40	762.0	74.147	0.957	0.000232	0.0129	0.0139
45	761.7	74.294	0.947	0.000229	0.0127	0.0140
50	760.9	74.461	0.920	0.000223	0.0124	0.0140

For *q* and also Absorption Coefficient, see Ethane, page 133.

## HEXANE C<sub>6</sub>H<sub>14</sub>.

SOLUBILITY IN METHYL ALCOHOL.  
(Rothmund — Z. physik. Chem. 26, 475, '98.)

Determined by Synthetic Method, see page 9.

t°.	Gms. Hexane per 100 Gms.		t°.	Gms. Hexane per 100 Gms.	
	Alcoholic Layer.	Hexane Layer.		Alcoholic Layer.	Hexane Layer.
10	26.5	96.8	35	43.6	91.2
20	31.6	95.9	40	52.7	85.5
30	38.3	93.7		42.6 (crit. t.)	68.9

## HIPPURIC ACID C<sub>6</sub>H<sub>5</sub>CONH.CH<sub>2</sub>COOH.

SOLUBILITY IN Aq. POTASSIUM HIPPURATE SOLUTIONS AT 20°.  
(Hoitsema — Z. physik. Chem. 27, 317, '98.)

Density of Solutions.	Gram Mols. per Liter Sol.		Grams per Liter Solution.		Solid Phase.
	C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> .	KC <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> .	C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> .	KC <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> .	
1.002	0.0182	0	3.276	0.0	C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub>
1.003	0.0163	0.011	2.919	2.39	"
1.008	0.0183	0.071	3.278	15.43	"
1.022	0.0234	0.254	4.191	55.18	"
1.114	0.064	1.36	11.47	295.4	"
1.182	0.131	2.21	23.46	480.1	"
1.192	0.147	2.32	26.32	504.1	C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> + C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> .KC <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> .H <sub>2</sub> O
1.195	0.153	2.40	27.40	521.4	
1.201	0.133	2.50	23.82	543.1	C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> .KC <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> .H <sub>2</sub> O
1.239	0.084	3.01	15.04	654.0	"
1.282	0.068	3.57	12.18	775.7	C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> .KC <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> .H <sub>2</sub> O + KC <sub>6</sub> H <sub>5</sub> NO <sub>2</sub>
1.282	0.065	3.58	11.60	777.8	
1.276	0.031	3.56	5.55	773.4	KC <sub>6</sub> H <sub>5</sub> NO <sub>2</sub>
1.277	0.011	3.55	1.917	771.3	"
1.277	0.00	3.56	...	773.4	"

**HOMATROPINE HYDROBROMIDE****HOMATROPINE HYDROBROMIDE**  $C_{11}H_{21}NO_3 \cdot HBr$ .**SOLUBILITY IN WATER, ETC.**

(U. S. P.)

100 grams water dissolve 17.5 grams salt at 25°.

100 grams alcohol dissolve 3.08 grams salt at 25°, and 11.5 grams at 60°.

100 grams chloroform dissolve 0.16 gram salt at 25°.

**HYDRASTINE**  $C_{11}H_{21}NO_6$ .**HYDRASTINE HYDROCHLORIDE** $C_{11}H_{21}NO_6 \cdot HCl$ .**SOLUBILITY IN SEVERAL SOLVENTS.**

(U. S. P.; Müller—Apoth.-Ztg. 18, 249, '03.)

Solvent.	Gms. $C_{11}H_{21}NO_6$ per 100 Gms. Solution.		Solvent.	Gms. per 100 Gms. Solution at 18°-22°.	
	At 18°-22°.	At 80°.		$C_{11}H_{21}NO_6$ .	$C_{11}H_{21}NO_6 \cdot HCl$ .
Water	0.0033	0.025	Ether	0.51	0.078 (25°)
Alcohol	0.74 (25°)	5.9 (60°)	Ether + $H_2O$	0.80	...
Benzene	8.89	...	Chloroform	100+	0.35 (25°)
Acetic Ether	4.05	...	$CCl_4$	0.123	...
Petroleum Ether	0.073	...			

**HYDRAZINE SULPHATE**  $N_2H_4 \cdot H_2SO_4$ .100 grams water dissolve 3.055 grams  $N_2H_4 \cdot H_2SO_4$  at 22°.

(Curtius and Jay—J. pr. Chem. [2] 39, 39, '89.)

**HYDROBROMIC ACID**  $HBr$ .**SOLUBILITY IN WATER.**

(Roozeboom—Z. physik. Chem. 2, 454, '88; Rec. trav. chim. 4, 107, '85; 5, 358, '86; see also Pickering—Phil. Mag. [5] 36, 119, '03.)

t°.	Gms. $HBr$ Dissolved (at 760-765 mm.) per 100 Gms.		$\beta$ .	Gms. $HBr$ Dissolved at Lower Pressures per 100 Gms. $H_2O$ .
	Water.	Solution.		
- 2.5	255.0	71.83	...	175.0 (10 mm.)
- 15	239.0	70.50	...	...
0	221.2	68.85	611.6	...
+ 10	210.3	67.76	581.4	108.5 (5 mm.)
15	204.0	67.10	...	...
25	193.0	65.88	532.1	...
50	171.5	63.16	468.6	...
75	150.5	60.08	406.7	...
100	130.0	56.52	344.6	...

For  $\beta$  see Ethane, page 133.

## HYDROCHLORIC ACID

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## HYDROCHLORIC ACID HCl.

## SOLUBILITY IN WATER AT DIFFERENT TEMPERATURES AND PRESSURES.

(Deicke; Roscoe and Dittmar — Liebig's Ann. 112, 334, '59; below 0°, Roeseboom — Rec. trav. chim. 3, 104, '84.)

t°.	At Different Temperatures and 760 mm. Pressure.				At Different Pressures and 0°.	
	cc. HCl per 100 cc. H <sub>2</sub> O.	Density.	Gms. HCl per 100 g. Sol.	Gms. HCl per 100 g. H <sub>2</sub> O.	Pressures.*	Gms. HCl per 100 g. H <sub>2</sub> O.
0	525.2	1.2257	45.15	82.31	60	61.3
4	497.7	1.2265	44.36	79.73	100	65.7
8	480.3	1.2185	43.83	78.03	150	68.6
12	471.3	1.2148	43.28	76.30	200	70.7
14	462.4	1.2074	42.83	74.92	300	73.8
18	451.2	1.2064	42.34	73.41	400	76.3
23	435.0	1.2014	41.54	71.03	500	78.2
30	...	...	40.23	67.3	600	80.0
40	...	...	38.68	63.3	750	82.4
50	...	...	37.34	59.6	1000	85.6
60	...	...	35.94	56.1	1300	89.5

\* Pressures in mm. Hg minus tension of H<sub>2</sub>O vapor.

## SOLUBILITY IN WATER AT TEMPERATURES BELOW 0°:

At a pressure of 760 mm.

At pressures below and above 760 mm.

t°.	g.	t°.	g.	t°.	mm. Pressure.	g.
-24	101.2	-15	93.3	-23.8	...	84.2
-21	98.3	-10	89.8	-21	334	86.8
-18.3	96.0	-5	86.8	-19	580	92.6
-18	95.7	0	84.2	-18	900	98.4
				-17.7	1073	101.4

For value of *q*, see Ethane, page 133.

## SOLUBILITY OF HYDROCHLORIC ACID GAS IN METHYL ALCOHOL, ETHYL ALCOHOL, AND IN ETHER AT 760 MM. PRESSURE.

(de Bruyn — Rec. trav. chim. 11, 129, '92; Schuncke — Z. physik. Chem. 14, 336, '94.)

t°.	Grams HCl gas per 100 Grams Solution in:		
	CH <sub>3</sub> OH.	C <sub>2</sub> H <sub>5</sub> OH.	(C <sub>2</sub> H <sub>5</sub> ) <sub>2</sub> O.
-10	54.6	...	37.51 (-9.2°)
-5	...	...	37.0
0	51.3	45.4	35.6
+5	...	44.2 (6.5°)	33.1
10	...	42.7 (11.5°)	30.35
15	...	...	27.62
20	47.0 (18°)	41.0	24.9
25	...	40.2 (23.5°)	22.18
30	43.0 (31.7°)	38.1 (32°)	19.47

**HYDROFLUORIC ACID HF.**100 grams  $H_2O$  dissolve 111 grams HF at  $35^\circ$ .

(Metzner — Compt. rend. 119, 683, '94.)

**HYDRIODIC ACID HI. IODIC ACID  $HIO_3$ .**

For determinations of the freezing points of aqueous solutions of HI, and isolation of the several hydrates at temperatures below  $0^\circ$ , see Pickering — Ber. 26, 2307, '93.

**SOLUBILITY OF IODIC ACID AND ITS MODIFICATIONS IN WATER.**

(Groschuff — Z. anorg. Chem. 47, 343, '05.)

$t^\circ$ .	Grams per 100 Gms. Solution.		Gram Mols. $I_2O_5$ per 100 Gm. Mols.		Solid Phase.
	$HIO_3$ .	$I_2O_5$ .	$H_2O$ .	Solution.	
-14	72.8	69.1	12.1	10.8	Ice + $HIO_3$
0	74.1	70.3	12.8	11.3	
16	75.1	71.7	13.7	12.0	"
40	77.7	73.7	15.1	13.2	"
60	80.0	75.9	17.0	14.5	"
80	82.5	78.3	19.4	16.3	"
85	83.0	78.7	20.0	16.7	"
101	85.2	80.8	22.8	18.6	"
110	86.5	82.1	24.7	19.8	$HIO_3 + HI_2O_3$
125	87.2	82.7	25.9	20.6	
140	88.3	83.8	27.9	21.8	"
160	90.5	85.9	32.8	24.7	"

**SOLUBILITY OF IODIC ACID IN NITRIC ACID.**

(Groschuff.)

$t^\circ$ .	Grams $HIO_3$ per 100 Grams.		
	Aq. Solution.	27.73% $HNO_3$ Solution.	40.88% $HNO_3$ Solution.
0	74.1	18.0	9.0
20	75.8	21.0	10.0
40	77.7	27.0	14.0
60	80.0	38.0	18.0

**HYDROGEN H.****SOLUBILITY IN WATER.**

(Winkler — Ber. 24, 99, '91; Bohr and Bock — Wied. Ann. 44, 318, '91; Timofejew — Z. physik. Chem. 6, 147, '90.)

$t^\circ$ .	$\beta'$ .	$l$ .		$\beta$ .	$q$ .
0	0.0214	...	...	0.0214	0.000193
5	0.0203	0.0209	— 0.0241	0.0204	0.000184
10	0.0193	0.0204	— 0.0229	0.0195	0.000176
15	0.0185	0.0200	— 0.0217	0.0188	0.000169
20	0.0178	0.0196	— 0.0205	0.0182	0.000162
25	0.0171	0.0193	— 0.0191	0.0175	0.000156
30	0.0163	...	...	0.0170	0.000147
40	0.0153	...	...	0.0164	0.000139
50	0.0141	...	...	0.0161	0.000129
60	0.0129	...	...	0.0160	0.000119
80	0.0085	...	...	0.0160	0.000079
100	0.0000	...	...	0.0160	0.000000

$l$  = Ostwald Solubility Expression, see page 105. For  $\beta'$ ,  $\beta$ , and  $q$ , see Ethane, page 133.

## HYDROGEN

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## SOLUBILITY OF HYDROGEN IN AQUEOUS SOLUTIONS OF ACIDS AND BASES AT 25°.

(Geffcken — Z. physik. Chem. 49, 268, '04.)

Gram Equiv. Acids and Bases per Liter.	Solubility of H ( $l_{25}$ = Ostwald Expression) in Solutions of:						
	HCl.	HNO <sub>3</sub> .	$\frac{1}{2}$ H <sub>2</sub> SO <sub>4</sub> .	CH <sub>3</sub> COOH.	CH <sub>3</sub> ClCOOH.	KOH.	NaOH.
0.0	0.0193	0.0193	0.0193	0.0193	0.0193	0.0193	0.0193
0.5	0.0186	0.0188	0.0185	0.0192	0.0189	0.0167	0.0165
1.0	0.0179	0.0183	0.0177	0.0191	0.0186	0.0142	0.0139
2.0	0.0168	0.0174	0.0163	0.0188	0.0180	...	0.0097
3.0	0.0159	0.0167	0.0150	0.0186	...	...	0.0072
4.0	...	0.0160	0.0141	0.0186	...	...	0.0055

The above figures for the concentrations of acids and bases were calculated to grams per liter, and these values with the corresponding  $l_{25}$  values for the solubility of hydrogen plotted on cross-section paper. From the resulting curves the following table was read.

Grams Acids and Bases per Liter.	Solubility of H ( $l_{25}$ = Ostwald Expression) in Solutions of:						
	HCl.	HNO <sub>3</sub> .	$\frac{1}{2}$ H <sub>2</sub> SO <sub>4</sub> .	CH <sub>3</sub> COOH.	CH <sub>3</sub> ClCOOH.	KOH.	NaOH.
0	0.0193	0.0193	0.0193	0.0193	0.0193	0.0193	0.0193
20	0.0185	0.0189	0.0186	0.0192	0.0191	0.0172	0.0165
40	0.0179	0.0186	0.0180	0.0191	0.0190	0.0153	0.0140
60	0.0173	0.0183	0.0174	0.0190	0.0188	0.0135	0.0117
80	0.0167	0.0180	0.0168	0.0189	0.0187	...	0.0097
100	0.0160	0.0179	0.0162	0.0189	0.0185	...	0.0082
150	...	0.0171	0.0148	0.0188	0.0182	...	0.0058
200	...	0.0165	0.0140	0.0186	0.0179	...	...
250	...	0.0160	...	0.0184	...	...	...

For Ostwald Solubility Expression, see page 105.

## SOLUBILITY OF HYDROGEN IN AQUEOUS SOLUTIONS OF AMMONIUM NITRATE AT 20°.

(Knopp — Z. physik. Chem. 43, 103, '04.)

$\rho$ .	Normality (per 1000 Gms.) H <sub>2</sub> O.	Molecular Concentra- tion.	Absorption Coefficient of Hydrogen.	Density of Solutions.
0.00	0.00	0.00	0.0188	...
1.037	0.1308	0.002352	0.01872	1.0027
2.167	0.2765	0.004956	0.01845	1.0072
3.378	0.4363	0.007799	0.01823	1.0122
4.823	0.6333	0.011280	0.01773	1.0182
6.773	0.9069	0.016447	0.01744	1.0262
11.550	1.6308	0.028525	0.01647	1.04652

# SOLUBILITY OF HYDROGEN IN AQUEOUS SOLUTIONS OF BARIUM CHLORIDE.

(Braun — Z. physik. Chem. 33, 735, '00.)

Gms. BaCl <sub>2</sub> per 100 Gms. Solution.	Coefficient of Absorption of Hydrogen at :				
	5°.	10°.	15°.	20°.	25°.
0.00	0.0237	0.0221	0.0206	0.0191	0.0175
3.29	0.0211	0.0198	0.0185	0.0172	0.0157
3.6	0.0209	0.0197	0.0184	0.0170	0.0156
6.45	0.0196	0.0186	0.0173	0.0161	0.0147
7.00	0.0194	0.0183	0.0172	0.0159	0.0146

# SOLUBILITY OF HYDROGEN IN AQUEOUS SOLUTIONS OF CALCIUM CHLORIDE, MAGNESIUM SULPHATE, AND LITHIUM CHLORIDE AT 15°.

(Gordon — Z. physik. Chem. 18, 14, '95.)

Coefficient of Absorption of hydrogen in water at 15° = 0.01883.

In Calcium Chloride.			In Magnesium Sulphate.			In Lithium Chloride.		
Gms. CaCl <sub>2</sub> per 100 g. Sol.	G. M. CaCl <sub>2</sub> per Liter.	Absorption Coefficient of H.	Gms. MgSO <sub>4</sub> per 100 g. Sol.	G. M. MgSO <sub>4</sub> per Liter.	Absorption Coefficient of H.	Gms. LiCl per 100 g. Sol.	G. M. LiCl per Liter.	Absorption Coefficient of H.
3.47	0.321	0.01619	4.97	0.433	0.01501	3.48	0.835	0.01619
6.10	0.578	0.01450	10.19	0.936	0.01159	7.34	1.800	0.01370
11.33	1.122	0.01138	23.76	2.501	0.00499	14.63	3.734	0.0099
17.52	1.1827	0.00839						
26.34	2.962	0.00519						

For definition of Coefficient of Absorption, see page 105.

# SOLUBILITY OF HYDROGEN IN AQUEOUS SOLUTIONS OF POTASSIUM CARBONATE, CHLORIDE, AND NITRATE AT 15°.

(Gordon.)

In Potassium Carbonate.			In Potassium Chloride.			In Potassium Nitrate.		
Gms. K <sub>2</sub> CO <sub>3</sub> per 100 g. Sol.	G. M. K <sub>2</sub> CO <sub>3</sub> per Liter.	Absorption Coefficient of H.	Gms. KCl per 100 g. Sol.	G. M. KCl per Liter.	Absorption Coefficient of H.	Gms. KNO <sub>3</sub> per 100 g. Sol.	G. M. KNO <sub>3</sub> per Liter.	Absorption Coefficient of H.
2.82	0.209	0.01628	3.83	0.526	0.01667	4.73	0.482	0.01683
8.83	0.690	0.01183	7.48	1.051	0.01489	8.44	0.879	0.01559
16.47	1.376	0.00761	12.13	1.755	0.01279	16.59	1.820	0.01311
24.13	2.156	0.00462	19.21	2.909	0.01012	21.46	2.430	0.01180
41.81	4.352	0.00160	22.92	3.554	0.00892			

# SOLUBILITY OF HYDROGEN IN AQUEOUS SOLUTIONS OF POTASSIUM CHLORIDE AND NITRATE AT 20°.

(Knopp — Z. physik. Chem. 43, 103, '04.)

In Potassium Chloride.				In Potassium Nitrate.			
g.	Normality (per 1000 g. H <sub>2</sub> O).	Absorption Coefficient.	Density of Solutions.	g.	Normality (per 1000 g. H <sub>2</sub> O).	Absorption Coefficient.	Density of Solutions.
1.089	0.1475	0.01823	1.0052	1.224	0.1245	0.01835	1.0059
2.123	0.2907	0.01757	1.0118	2.094	0.2114	0.01818	1.0113
4.070	0.5687	0.01661	1.0243	4.010	0.4127	0.01785	1.0236
6.375	0.9127	0.01531	1.0394	5.925	0.6225	0.01743	1.0359
7.380	1.0682	0.01472	1.0460	7.742	0.8293	0.01667	1.0477
13.612	2.1222	0.01255	1.0875	13.510	1.5436	0.01436	1.0865

# HYDROGEN

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## SOLUBILITY OF HYDROGEN IN AQUEOUS SODIUM CARBONATE AND SULPHATE SOLUTIONS AT 15°.

(Gordon.)

In Sodium Carbonate.			In Sodium Sulphate.		
Gms. Na <sub>2</sub> CO <sub>3</sub> per 100 Gms. Solution.	G. M. Na <sub>2</sub> CO <sub>3</sub> per Liter.	Absorption Coefficient of H.	Gms. Na <sub>2</sub> SO <sub>4</sub> per 100 Gms. Solution.	G. M. Na <sub>2</sub> SO <sub>4</sub> per Liter.	Absorption Coefficient of H.
2.15	0.207	0.01639	4.58	0.335	0.01519
8.64	0.438	0.01385	8.42	0.638	0.0154
11.53	1.218	0.00839	16.69	1.364	0.00775

## SOLUBILITY OF HYDROGEN IN AQUEOUS SOLUTIONS OF SODIUM CHLORIDE.

(Braun; Gordon.)

Gms. NaCl per 100 Gms. Solution.	Coefficient of Absorption of Hydrogen at:				
	5°.	10°.	15°.	20°.	25°.
1.25	0.0218	0.0205	0.0191	0.0177	0.0162
3.80	0.0198	0.0188	0.0176	0.0162	0.0148
4.48	0.0192	0.0182	0.0171	0.0159	0.0143
6.00	0.0184	0.0175	0.0164	0.0153	0.0138
14.78	...	...	0.0093	...	...
23.84	...	...	0.00595	...	...

## SOLUBILITY OF HYDROGEN IN AQUEOUS SOLUTIONS OF SODIUM NITRATE.

In Sodium Nitrate at 20°.

(Knopp.)

In Sodium Nitrate at 15°.

(Gordon.)

p.	Normality (per 1000 Gms. H <sub>2</sub> O).	Absorption Coefficient of H.	Density of Solutions.	Gms. NaNO <sub>3</sub> per 100 Gms. Solution.	G. M. NaNO <sub>3</sub> per Liter.	Absorption Coefficient of H.
1.041	0.1236	0.01839	1.0052	5.57	0.679	0.01603
2.192	0.2634	0.01774	1.0130	11.16	1.413	0.0137
4.405	0.5416	0.01694	1.0282	19.77	2.656	0.01052
6.702	0.8442	0.01518	1.04411	37.43	5.711	0.00578
12.637	1.7354	0.0130	1.08667			

## SOLUBILITY OF HYDROGEN IN ALCOHOL.

(Timofejew — Z. physik. Chem. 6, 147, '90.)

t°.	Coefficient of Abs. in 98.8% Alcohol.	t°.	Coefficient of Abs. in 99.7% Alcohol.
0	0.0676	4	0.0749
6.2	0.0693	18.8	0.0740
13.4	0.0705		
18.8	0.0740		

## SOLUBILITY IN AQUEOUS ALCOHOL SOLUTIONS AT 20° AND 760 MM. PRESSURE.

(Lubarsch — Wied. Ann. [2] 37, 525, '89.)

Wt. % Alcohol.	Vol. % Absorbed H.	Wt. % Alcohol.	Vol. % Absorbed H.
0.00	1.93	28.57	1.04
9.09	1.43	33.33	1.17
16.67	1.29	50.0	2.02
23.08	1.17	66.67	2.55

## SOLUBILITY OF HYDROGEN IN AQUEOUS SUGAR SOLUTIONS AT 15°.

(Gordon — Z. physik. Chem. 18, 14, '95.)

Gms. Sugar per 100 Gms. Solution.	Gm. Mols. Sugar per Liter.	Absorption Coefficient of H.
16.67	0.520	0.01561
30.08	0.993	0.01284
47.65	1.699	0.00892

## SOLUBILITY OF HYDROGEN IN WATER AND IN ORGANIC SOLVENTS.

Results in terms of the Ostwald Expression, see page 105.

(Just — Z. physik. Chem. 37, 359, '01.)

Solvent.	$l_{25}$ .	$l_{20}$ .	Solvent.	$l_{25}$ .	$l_{20}$ .
Water	0.0199	0.0200	Amyl Acetate	0.0774	0.0743
Anilin	0.0285	0.0303	Xylene	0.0819	0.0783
Amyl Alcohol	0.0301	0.0353	Ethyl Acetate	0.0852	0.0788
Nitro Benzene	0.0371	0.0353	Toluene	0.0874	0.0838
Carbon Disulphide	0.0375	0.0336	Ethyl Alcohol (98.8%)	0.0894	0.0862
Acetic Acid	0.0633	0.0617	Methyl Alcohol	0.0945	0.0902
Benzene	0.0756	0.0707	Iso Butyl Alcohol	0.0976	0.0929
Acetone	0.0764	0.0703			

SOLUBILITY OF HYDROGEN IN CHLORAL HYDRATE SOLUTIONS  
AT 20°.

(Knopp.)

$\rho$ .	Normality (per 1000 Gms. H <sub>2</sub> O).	Molecular Concentration.	Absorption Coefficient of H.	Density of Solutions.
4.91	0.310	0.005594	0.01839	1.0202
7.69	0.504	0.008992	0.01802	1.0320
14.56	1.030	0.018223	0.01712	1.0669
29.50	2.530	0.043601	0.01542	1.1466
38.42	3.770	0.063647	0.01440	1.1982
49.79	6.000	0.097493	0.01353	1.2724
63.90	10.700	0.161660	0.01307	1.3743

## SOLUBILITY OF HYDROGEN IN PROPIONIC ACID SOLUTIONS.

(Braun.)

G. C <sub>3</sub> H <sub>7</sub> COOH per 100 Gms. Solution.	Coefficient of Absorption of Hydrogen at:				
	5°.	10°.	15°.	20°.	25°.
2.63	0.02245	0.0214	0.0200	0.0188	0.0172
3.37	0.0222	0.0212	0.0199	0.0187	0.0171
5.27	0.0224	0.0212	0.0198	0.0184	0.0171
6.50	0.0218	0.0209	0.0193	0.0183	0.0169
9.91	0.0213	0.0203	0.0191	0.0178	0.0160

## SOLUBILITY OF HYDROGEN IN PETROLEUM.

(Griewasz and Walisz — Z. physik. Chem. 1, 70, '87.)

Coefficient of absorption at 20° = 0.0582, at 10° = 0.0652.



## HYDROGEN SULPHIDE 150

### HYDROGEN SULPHIDE H<sub>2</sub>S.

SOLUBILITY IN WATER AND IN ALCOHOL AT 0° AND 760 MM. PRESSURE.  
(Bunsen and Carius; Fauser — Math. u Natur. W. Ber. (Ungarn.) 6, 154, '88.)

In Water.				In Alcohol.	
t°.	1 Vol. H <sub>2</sub> O Absorbs	β.	q.	1 Vol. Alcohol Absorbs	
0	4.37 Vols. H <sub>2</sub> S(at 0° and 760 mm.)	4.686	0.710	17.89 Vols. H <sub>2</sub> S(at 0° and 760 mm.)	
5	3.97 "	4.063	0.615	14.78 "	
10	3.59 "	3.520	0.530	11.99 "	
15	3.23 "	3.056	0.458	9.54 "	
20	2.91 "	2.672	0.398	7.42 "	
25	2.61 "	...	...	5.96 (24°)	
30	2.33 "	...	...	...	
35	2.08 "	...	...	...	
40	1.86 "	...	...	...	

For β and q see Ethane, page 133.

### SOLUBILITY OF HYDROGEN SULPHIDE IN AQUEOUS SALT SOLUTIONS AT 25°.

(McLauchlan — Z. physik. Chem. 44 615, '03.)

NOTE. — The original results are given in terms of  $\frac{l}{l_0}$  which is the iodine titer (*l*) of the H<sub>2</sub>S dissolved in the salt solution divided by the titer (*l*<sub>0</sub>) of the H<sub>2</sub>S dissolved in pure water. These figures were multiplied by 2.61 (see 25° results in preceding table) and the products recorded in the following table as volumes of H<sub>2</sub>S absorbed by 1 vol. of aqueous solution.

Solution.	Grams Salt per Liter.	$\frac{l}{l_0}$	Vols. H <sub>2</sub> S per 1 Vol. Sol.	Solution.	Grams Salt per Liter.	$\frac{l}{l_0}$	Vols. H <sub>2</sub> S per 1 Vol. Sol.
n NH <sub>4</sub> Br	98.0	1.00	2.61	n KBr	119.0	0.945	2.47
n NH <sub>4</sub> Cl	53.4	0.96	2.40	n KCl	74.5	0.853	2.22
n NH <sub>4</sub> NO <sub>3</sub>	80.0	0.99	2.58	n KNO <sub>3</sub>	101.0	0.913	2.38
$\frac{1}{2}$ n (NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub>	33.0	0.82	2.14	$\frac{1}{2}$ n K <sub>2</sub> SO <sub>4</sub>	43.5	0.78	2.04
$\frac{1}{2}$ n (NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub>	16.5	0.91	2.37	$\frac{1}{2}$ n K <sub>2</sub> SO <sub>4</sub>	21.7	0.89	2.32
n NH <sub>4</sub> C <sub>2</sub> H <sub>3</sub> O <sub>2</sub>	77.1	1.09	2.84	n KI	166.0	0.98	2.56
n (NH <sub>2</sub> ) <sub>2</sub> CO	60.1	1.02	2.66	n NaBr	103.0	0.935	2.44
$\frac{1}{2}$ n HCl	18.22	0.975	2.54	n NaCl	58.5	0.847	2.21
$\frac{1}{2}$ n H <sub>2</sub> SO <sub>4</sub>	24.52	0.905	2.36	$\frac{1}{2}$ n NaCl	29.2	0.93	2.42
n C <sub>6</sub> H <sub>5</sub> O <sub>6</sub>	150.0	0.944	2.46	n NaNO <sub>3</sub>	85.0	0.893	2.32
$\frac{3}{4}$ n C <sub>6</sub> H <sub>5</sub> O <sub>6</sub>	450.0	0.858	2.24	$\frac{1}{2}$ n Na <sub>2</sub> SO <sub>4</sub>	35.5	0.73	1.90
Pure C <sub>6</sub> H <sub>5</sub> (OH) <sub>2</sub>	1000.0	0.863	2.26	$\frac{1}{2}$ n Na <sub>2</sub> SO <sub>4</sub>	17.8	0.89	2.32

### HYDROQUINONE C<sub>6</sub>H<sub>4</sub>(OH)<sub>2</sub> 1:4, also Resorcin C<sub>6</sub>H<sub>4</sub>(OH)<sub>2</sub> 1:3 and Pyrocatechin C<sub>6</sub>H<sub>4</sub>(OH)<sub>2</sub> 1:2.

#### SOLUBILITY IN WATER.

(Vaubel — J. pr. Chem. [2] 59, 30, '99.)

100 grams solution contain 6.7 grams hydroquinone at 20°. Sp. Gr. of sol. = 1.012.

100 grams solution contain 63.7 grams resorcin at 20°.

100 grams solution contain 31.1 grams pyrocatechin at 20°.

# SOLUBILITY OF HYDROQUINONE IN SULPHUR DIOXIDE IN THE CRITICAL VICINITY.

(Centnerswer and Teletow — Z. Electrochem. 9, 799, '03.)

Determinations made by the Synthetic Method, for which see Note, page 9.

t°.	Gms. Hydroquinone per 100 Gms. Sol.	t°.	Gms. Hydroquinone per 100 Gms. Sol.	t°.	Gms. Hydroquinone per 100 Gms. Solution.
63	0.89	117.6	4.46	136.7	10.31
73.5	1.22	123.3	5.66	141.4	13.3
89.2	2.18	134.2	8.31	145.0	14.9

# HYDROXYLAMINE $\text{NH}_2(\text{OH})$ . HYDROXYLAMINE HYDRO-CHLORIDE $\text{NH}_2(\text{OH})\cdot\text{HCl}$ .

## SOLUBILITY IN SEVERAL SOLVENTS.

(de Bruyn — Rec. trav. chim. 11, 18, '92; Z. physik. Chem. 10, 783, '92.)

Solvent.	t°.	Grams $\text{NH}_2\text{OH}$ per 100 Gms. Solution.	t°.	Grams $\text{NH}_2(\text{OH})\cdot\text{HCl}$ per 100 Gms. Solution.
Methyl Alcohol (abs.)	5°	35.0	19.75	16.4
Ethyl Alcohol (abs.)	15°	15.0	19.75	4.43
Ether (dry)	(b. pt.)	1.2	...	...
Ethyl Acetate	(b. pt.)	1.6	...	...

For densities of  $\text{NH}_2(\text{OH})\cdot\text{HCl}$  solutions, see Schiff and Monsacchi — Z. physik. Ch. 21, 277, '96.

# HYOSCYAMINE $\text{C}_{17}\text{H}_{21}\text{NO}_3$ .

## SOLUBILITY IN SEVERAL SOLVENTS AT 18°–22°.

(Müller — Apoth.-Ztg. 18, 249, '03.)

Solvent.	Gms. $\text{C}_{17}\text{H}_{21}\text{NO}_3$ per 100 Gms. Solution.	Solvent.	Gms. $\text{C}_{17}\text{H}_{21}\text{NO}_3$ per 100 Gms. Solution.
Water	0.355	Chloroform	100+
Ether	2.02	Acetic Ether	4.903
Ether sat. with $\text{H}_2\text{O}$	3.913	Petroleum Ether	0.098
Water sat. with Ether	3.125	Carbon Tetra Chloride	0.059
Benzene	0.769		

# HYOSCINE HYDROBROMIDE, etc.

## SOLUBILITY IN SEVERAL SOLVENTS AT 25°.

(U. S. P.)

Solvent.	Grams per 100 Grams Solvent.		
	Hyosine Hydrobromide $\text{C}_{17}\text{H}_{21}\text{NO}_4\cdot\text{HBr}\cdot 3\text{H}_2\text{O}$ .	Hyoscyamine Hydrobromide $\text{C}_{17}\text{H}_{23}\text{NO}_3\cdot\text{HBr}$ .	Hyoscyamine Sulphate $(\text{C}_{17}\text{H}_{23}\text{NO}_3)_2\cdot\text{H}_2\text{SO}_4$ .
Water	66.6	very soluble	very soluble
Alcohol	6.2	50	15.6
Ether	...	0.062	0.04
Chloroform	0.133	40.0	0.043

# IODINE

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## IODINE I.

### SOLUBILITY IN WATER.

t°.	Gms. I per Liter Solution.	Authority.
15	0.272-0.283	(Dietz — Pharm. Ztg. 43, 290, '98.)
25	0.279	(McLauchlan — Z. physik. Chem. 44, 617, '03.)
25	0.304	(Herz and Knoch — Z. anorg. Chem. 45, 269, '05.)
25	0.339	(Jakowkin — Z. physik. Chem. 18, 590, '95.)
25	0.340	(Noyes and Seidensticker — Z. physik. Chem. 27, 359, '98.)
30	0.457	(Dietz.)

### SOLUBILITY OF IODINE IN AQUEOUS POTASSIUM IODIDE SOLUTIONS AT 25°.

(Noyes and Seidensticker; Bruner — Z. physik. Chem. 26, 147, '98.)

Millimols per Liter.		Gms. per Liter.		Results by Bruner.	
KI.	(I <sub>2</sub> ).	KI.	I.	Gms. KI per 1000 g. Sol.	Gms. I per Liter.
0.000	1.342	0.00	0.340	10	0.78*
0.830	1.814	1.37	0.461	20	1.60
1.661	2.235	2.75	0.568	40	3.25
3.322	3.052	5.51	0.775	60	5.04
6.643	4.667	11.03	1.185	80	6.94
13.29	8.003	22.07	2.032	100	8.96
26.57	14.68	44.15	3.728		
53.15	28.03	88.3	7.119		
106.3	55.28	176.6	14.04		

\* There is some uncertainty in regard to the position of the decimal point in this column. By calculation from the original it should be one place further to the right.

### SOLUBILITY OF IODINE IN AQUEOUS SALT SOLUTIONS AT 25°.

(McLauchlan.)

Salt.	Gms. Salt per Liter.	Gms. Dissolved I per Liter.	Salt.	Gms. Salt per Liter.	Gms. Dissolved I per Liter.
Na <sub>2</sub> SO <sub>4</sub>	29.77	0.160	NH <sub>4</sub> Cl	53.4	0.735
K <sub>2</sub> SO <sub>4</sub>	43.5	0.238	NaBr	103.0	3.29
(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub>	33.0	0.246	KBr	119.0	3.801
NaNO <sub>3</sub>	85.0	0.257	NH <sub>4</sub> Br	98.0	4.003
KNO <sub>3</sub>	101.2	0.266	NH <sub>4</sub> C <sub>2</sub> H <sub>3</sub> O <sub>2</sub>	77.1	0.440
NH <sub>4</sub> NO <sub>3</sub>	80.0	0.375	(NH <sub>4</sub> ) <sub>2</sub> C <sub>2</sub> H <sub>4</sub>	86.9	0.980
NaCl	58.5	0.575	H <sub>3</sub> BO <sub>3</sub>	55.8	0.300
KCl	73.6	0.658			

### SOLUBILITY OF IODINE IN ARSENIC TRI CHLORIDE.

(Sloan and Mallet — Chem. News, 46, 194, '82.)

t°.	0°.	15°.	50°.
Gms. I per 100 gms. AsCl <sub>3</sub>	8.42	11.88	36.89

# SOLUBILITY OF IODINE IN AQUEOUS ETHYL AND NORMAL PROPYL ALCOHOL SOLUTIONS AT 15°.

(Bruner — Z. physik. Chem. 26, 147, '98.)

In Aq. Ethyl Alcohol.				In Aq. Propyl Alcohol.			
Gms. C <sub>2</sub> H <sub>5</sub> OH per 100 Gms. Solvent.	Gms. I per 100 cc. Solution.	Gms. C <sub>2</sub> H <sub>5</sub> OH per 100 Gms. Solvent.	Gms. I per 100 cc. Sol.	Gms. C <sub>3</sub> H <sub>7</sub> OH per 100 Gms. Solvent.	Gms. I per 100 cc. Sol.	Gms. C <sub>3</sub> H <sub>7</sub> OH per 100 Gms. Solvent.	Gms. I per 100 cc. Sol.
10	0.05	60	1.14	10	0.05	60	2.71
20	0.06	70	2.33	20	0.11	70	4.10
30	0.10	80	4.20	30	0.40	80	6.05
40	0.26	90	7.47	40	0.94	90	9.17
50	0.88	100	15.67	50	1.64	100	14.93

# SOLUBILITY OF IODINE IN BENZENE, CHLOROFORM, AND IN ETHER.

(Arctowski — Z. anorg. Chem. 11, 276, '95-'96.)

In Benzene.		In Chloroform.		In Ether.	
t°.	Gms. I per 100 Gms. Solution.	t°.	Gms. I per 100 Gms. Solution.	t°.	Gms. I per 100 Gms. Solution.
4.7	8.08	-49	0.188	-83	15.39
6.6	8.63	-55½	0.144	-90	14.58
10.5	9.60	-60	0.129	-108	15.09
13.7	10.44	-69½	0.089		
16.3	11.23	-73½	0.080		
		+10	1.76 per 100 gms. CHCl <sub>3</sub>		

(Duncan — Pharm. J. Trans. 22, 544, '91-'92.)

# SOLUBILITY OF IODINE IN BROMOFORM, CARBON TETRA CHLORIDE, AND IN CARBON BISULPHIDE AT 25°.

(Jakowkin — Z. physik. Chem. 18, 590, '95.)

- 1 liter of saturated solution in CHBr<sub>3</sub> contains 189.55 gms. I.  
 1 liter of saturated solution in CCl<sub>4</sub> contains 30.33 gms. I.  
 1 liter of saturated solution in CS<sub>2</sub> contains 230.0 gms. I.

# SOLUBILITY OF IODINE IN CARBON BISULPHIDE SOLUTIONS.

(Arctowski — Z. anorg. Chem. 6, 404, '94.)

t°.	Gms. I per 100 Gms. Solution.	t°.	Gms. I per 100 Gms. Solution.	t°.	Gms. I per 100 Gms. Solution.
-100	0.32	0	7.89	30	19.26
-80	0.51	10	10.51	36	22.67
-63	1.26	15	12.35	40	25.22
-20	4.14	20	14.62	42	26.75
-10	5.52	25	16.92		

# **IODINE**

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## **SOLUBILITY OF IODINE IN MIXTURES OF CHLOROFORM AND ETHYL ALCOHOL, CHLOROFORM AND NORMAL PROPYL ALCOHOL, CHLOROFORM AND BENZENE, AND CHLOROFORM AND CARBON BISULPHIDE AT 15°.**

(Bruner.)

Gms. $\text{CHCl}_3$ per 100 Gms. of Mixtures.	Grams I Dissolved per 100 cc. of Mixtures of:			
	$\text{CHCl}_3 + \text{C}_2\text{H}_5\text{OH.}$	$\text{CH}_3\text{Cl} + \text{C}_2\text{H}_5\text{OH.}$	$\text{CH}_3\text{Cl} + \text{C}_6\text{H}_6.$	$\text{CH}_3\text{Cl} + \text{CS}_2.$
0	15.67	14.93	10.40	17.63
10	9.43	13.16	9.84	15.93
20	8.69	11.20	8.78	14.20
30	7.80	8.98	7.74	12.16
40	7.09	8.09	6.96	10.20
50	6.62	7.82	6.20	9.08
60	6.24	7.09	5.34	7.72
70	5.77	6.42	4.89	6.42
80	5.06	5.54	4.53	5.27
90	4.34	4.52	4.07	4.32
100	3.62	3.62	3.62	3.62

## **SOLUBILITY OF IODINE IN MIXTURES OF CARBON TETRA CHLORIDE AND BENZENE AND IN MIXTURES OF CARBON TETRA CHLORIDE AND CARBON BISULPHIDE AT 15°.**

(Bruner.)

Gms. $\text{CCl}_4$ per 100 Gms. of Mixtures.	Gms. I per 100 cc. of Mixture of:		Gms. $\text{CCl}_4$ per 100 Gms. of Mixtures.	Gms. I per 100 cc. of Mixture	
	$\text{CCl}_4 + \text{C}_6\text{H}_6.$	$\text{CCl}_4 + \text{CS}_2.$		$\text{CCl}_4 + \text{C}_6\text{H}_6.$	$\text{CCl}_4 + \text{CS}_2.$
0	10.40	17.6	60	4.90	5.55
10	9.44	14.44	70	4.09	4.50
20	8.53	12.33	80	3.41	3.37
30	7.77	10.34	90	2.74	2.60
40	6.63	8.60	100	2.06	2.06
50	5.70	6.83			

## **SOLUBILITY OF IODINE IN AQUEOUS GLYCERINE SOLUTIONS AT 25°.**

(Herz and Knoch — Z. anorg. Chem. 45, 269, '05.)

Density of glycerine at 25°/4° = 1.2555; impurities about 1.5%.

Wt. % Glycerine in Solvent.	Millimols I per 100 cc. Solution.	Grams I per 100 cc. Solution.	Density of Solutions at 25°/4°.
0	0.24	0.0304	0.9979
7.15	0.27	0.0342	1.0198
20.44	0.38	0.0482	1.0471
31.55	0.49	0.0621	1.0750
40.95	0.69	0.0875	1.0995
48.7	1.07	0.135	1.1207
69.2	2.20	0.278	1.1765
100.0	9.70	1.223	1.2646

### DISTRIBUTION OF IODINE BETWEEN CARBON BISULPHIDE AND Aq. POTASSIUM OXALATE.

(Dawson — Z. physik. Chem. 56, 610, '06; Dawson and McRae — J. Chem. Soc. 81, 1086, '02.)

Concentration of Aq. $K_2C_2O_4$ . Equiv.	Gms. I per Liter of		Vol. of Solution which Contains 1 Mol. I.	Fraction of I Uncombined in Solution.
	Aq. Layer.	$CS_2$ Layer.		
1.0	2.408	10.82	105.3	0.005495
1.0	3.555	16.32	71.37	0.00561
1.0	5.766	27.91	43.99	0.005915
1.0	6.861	34.01	36.98	0.006055
1.2	3.525	17.07	71.97	0.005645

### DISTRIBUTION OF IODINE BETWEEN AMYL ALCOHOL AND WATER AND BETWEEN AMYL ALCOHOL AND AQUEOUS POTASSIUM IODIDE SOLUTIONS AT 25°.

(Herz and Fischer — Ber. 37, 4752, '04.)

The original results were plotted on cross-section paper, and the following tables made from the curves.

Millimols I per 10 cc. Amyl Alcohol Layer in Each Case.	Millimols I per 10 cc. of $H_2O$ and of Aq. KI Layers.					
	$H_2O$ .	$\frac{N}{10}$ KI.	$\frac{2N}{10}$ KI.	$\frac{3N}{10}$ KI.	$\frac{4N}{10}$ KI.	$\frac{10N}{10}$ KI.
2.5	0.012	0.135	0.160	0.170	0.170	...
3.0	0.014	0.150	0.185	0.200	0.200	0.160
4.0	0.018	0.180	0.235	0.255	0.270	0.240
5	0.021	0.210	0.280	0.315	0.340	0.315
6	0.025	0.230	0.330	0.375	0.410	0.390
7	0.029	0.250	0.375	0.430	0.480	0.470
8	...	0.260	0.420	0.490	0.550	0.555
9	...	0.270	0.450	0.550	0.620	0.640
10	...	0.280	0.470	0.605	0.690	0.720
12	...	...	0.490	0.700	0.830	0.900
14	...	...	0.510	0.790	0.980	1.200
20	...	...	0.575	...	...	...

Gms. I per 100 cc. Amyl Alcohol Layer in Each Case.	Gms. I per 100 cc. of $H_2O$ and of KI Layers.					
	$H_2O$ .	$\frac{N}{10}$ KI.	$\frac{2N}{10}$ KI.	$\frac{3N}{10}$ KI.	$\frac{4N}{10}$ KI.	$\frac{10N}{10}$ KI.
3	0.014	0.164	0.20	0.21	0.21	...
4	0.016	0.196	0.24	0.26	0.26	0.21
6	0.026	0.252	0.34	0.38	0.40	0.37
8	0.033	0.297	0.43	0.49	0.54	0.51
10	0.040	0.328	0.51	0.61	0.67	0.69
12	...	0.341	0.58	0.73	0.81	0.84
14	...	...	0.60	0.83	0.95	1.00
16	...	...	0.63	0.91	1.09	1.20
18	...	...	0.64	...	...	...
25	...	...	0.71	...	...	...

The original figures for  $5N/10$  and  $10N/10$  KI solutions give practically identical curves.

Results for the distribution of Iodine between  $N/10$  KI solutions on the one hand, and mixtures in various proportions of  $C_5H_8 + CS_2$ ,  $C_5H_8CH_3 + CS_2$ ,  $C_5H_8 + C_5H_8CH_3$ ,  $C_5H_8 +$  light petroleum,  $CS_2 +$  light petroleum,  $CS_2 + CHCl_3$ ,  $CHCl_3 + C_5H_8$ ,  $CCl_4 + CS_2$ , and  $CCl_4 + C_5H_8CH_3$  on the other hand, are given by Dawson — J. Chem. Soc., 81, 1086, '02.

## IODINE

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### DISTRIBUTION OF IODINE BETWEEN WATER AND BROMOFORM, WATER AND CARBON BISULPHIDE, AND WATER AND CARBON

#### TETRA CHLORIDE AT 25°.

(Jakowkin — Z. physik. Chem. 18, 590, '95.)

Original results plotted on cross-section paper and table made from curves. Jakowkin points out that the results of Berthelot and Jungfleisch — Ann. chim. phys. [4] 26, 400, '72, are incorrect on account of the presence of HI.

Grams I per Liter of H <sub>2</sub> O Layer in Each Case.	Grams I per Liter of:		
	CHBr <sub>3</sub> Layer.	CS <sub>2</sub> Layer.	CCl <sub>4</sub> Layer.
0.05	20	30	4.0
0.10	45	60	8.5
0.15	71	91	13.0
0.20	100	126	17.5
0.25	130	160	22.0

### IODOFORM CHI<sub>3</sub>, IODOL C<sub>4</sub>I<sub>4</sub>NH (Tetra Iodo Pyrrol).

#### SOLUBILITY IN SEVERAL SOLVENTS.

(U. S. P.; Vulpis — Pharm. Centr. 34, 117, '93.)

Solvent.	t°.	Grams per 100 Grams Solvent.	
		CHI <sub>3</sub> .	C <sub>4</sub> I <sub>4</sub> NH.
Water	25	0.0106	0.0204
Alcohol	25	2.14 (1.43 gms. (V.))	11.1
Alcohol	b. pt.	(10.0 gms. (V.))	...
Ether	25	19.2 (16.6 gms. (V.))	66.6
Chloroform	25	...	0.95

### IRIDIUM DOUBLE SALTS.

#### SOLUBILITY IN WATER.

(Palmaer — Ber. 23, 3817; 24, 2090, '91.)

Double Salt.	Formula.	t°.	Gms. per 100 Gms. H <sub>2</sub> O.
Irido Pentamine Bromide	Ir(NH <sub>3</sub> ) <sub>5</sub> Br <sub>3</sub>	12.5	0.284
" " Bromonitrate	Ir(NH <sub>3</sub> ) <sub>5</sub> Br(NO <sub>3</sub> ) <sub>2</sub>	18	5.58
" " Tri Chloride	Ir(NH <sub>3</sub> ) <sub>5</sub> Cl <sub>3</sub>	15.1	6.53
" " Chloro Bromide	Ir(NH <sub>3</sub> ) <sub>5</sub> ClBr <sub>2</sub>	15	0.47
" " Chloro Iodide	Ir(NH <sub>3</sub> ) <sub>5</sub> ClI <sub>2</sub>	15	0.95
" " Chloro Nitrate	Ir(NH <sub>3</sub> ) <sub>5</sub> Cl(NO <sub>3</sub> ) <sub>2</sub>	15.4	1.94
" " Chloro Sulphate	Ir(NH <sub>3</sub> ) <sub>5</sub> ClSO <sub>4</sub> ·2H <sub>2</sub> O	15.0	0.74
" " Nitrate	Ir(NH <sub>3</sub> ) <sub>5</sub> (NO <sub>3</sub> ) <sub>3</sub>	16	0.28
" Aquo Pentamine Bromide	Ir(NH <sub>3</sub> ) <sub>5</sub> (OH <sub>2</sub> )Br <sub>3</sub>	ord. temp.	25.0
" " Chloride	Ir(NH <sub>3</sub> ) <sub>5</sub> (OH <sub>2</sub> )Cl <sub>3</sub>	ord. temp.	74.7
" " Nitrate	Ir(NH <sub>3</sub> ) <sub>5</sub> (OH <sub>2</sub> )(NO <sub>3</sub> ) <sub>3</sub>	17	10.0

### IRON BROMIDE (Ferrous) FeBr<sub>2</sub>·6H<sub>2</sub>O.

#### SOLUBILITY IN WATER.

(Etard — Ann. chim. phys. [7] 2, 537, '94.)

t°.	Gms. FeBr <sub>2</sub> per 100 Gms. Sol.	t°.	Gms. FeBr <sub>2</sub> per 100 Gms. Sol.	t°.	Gms. FeBr <sub>2</sub> per 100 Gms. Sol.
-20	47.0	30	55.0	60	59.0
0	50.5	40	56.2	80	61.5
20	53.5			100	64.0

### IRON CARBONATE (Ferrous) FeCO<sub>3</sub>.

100 gms. H<sub>2</sub>O saturated with CO<sub>2</sub> at 6-8 atmospheres dissolve 0.073 gram FeCO<sub>3</sub>.

(Wagner — Jahresber. Chem. 135, '67.)

**IRON CHLORIDE (Ferrous)  $\text{FeCl}_2 \cdot 4\text{H}_2\text{O}$ . SOLUBILITY IN WATER.**  
(Etard.)

t°.	Gms. $\text{FeCl}_2$ per 100 Gms. Solution.	Solid Phase.	t°.	Gms. $\text{FeCl}_2$ per 100 Gms. Solution.	Solid Phase.
10	39.2	$\text{FeCl}_2 \cdot 4\text{H}_2\text{O}$	60	47.0	$\text{FeCl}_2 \cdot 4\text{H}_2\text{O}$
15	40.0	"	80	50.0	"
25	41.5	"	87	51.2	$\text{FeCl}_2 \cdot 4\text{H}_2\text{O} + \text{FeCl}_2$
30	42.2	"	90	51.3	$\text{FeCl}_2$
40	43.6	"	100	51.4	"
50	45.2	"	120	51.8	"

**SOLUBILITY OF IRON CHLORIDE (FERRIC)  $\text{Fe}_2\text{Cl}_6$  IN WATER.**  
(Roozeboom — Z. physik. Chem. 10, 477, '92.)

t°.	Mols. $\text{Fe}_2\text{Cl}_6$ per 100 Mols. $\text{H}_2\text{O}$ .	Gms. $\text{FeCl}_3$ per 100 Gms. $\text{H}_2\text{O}$ .	Solid Phase.	t°.	Mols. $\text{Fe}_2\text{Cl}_6$ per 100 Mols. $\text{H}_2\text{O}$ .	Gms. $\text{FeCl}_3$ per 100 Gms. $\text{H}_2\text{O}$ .	Solid Phase.
			Solution.				Solution.
			Solid Phase, $\text{Fe}_2\text{Cl}_6 \cdot 12\text{H}_2\text{O}$ .				Solid Phase, $\text{Fe}_2\text{Cl}_6 \cdot 5\text{H}_2\text{O}$ (con.).
-55	2.75	49.52	33.12	35	15.64	281.6	73.79
-27	2.98	53.60	34.93	50	17.50	315.2	75.91
0	4.13	74.39	42.66	55	19.15	344.8	77.52
+20	5.10	91.85	47.88	55	20.32	365.9	78.54
30	5.93	106.8	51.64				Solid Phase, $\text{Fe}_2\text{Cl}_6 \cdot 4\text{H}_2\text{O}$ .
37	8.33	150.0	60.01	50	19.96	359.3	78.23
30	11.20	201.7	66.85	55	20.32	365.9	78.54
20	12.83	231.1	69.79	60	20.70	372.8	78.86
8	13.7	246.7	71.15	69	21.53	387.7	79.50
			Solid Phase, $\text{Fe}_2\text{Cl}_6 \cdot 7\text{H}_2\text{O}$ .	73.5	25.0	450.2	81.81
20	11.35	204.4	67.14	70	27.9	502.4	83.41
32	13.55	244.0	70.92	66	29.2	525.9	84.03
30	15.12	272.4	73.13				Solid Phase, $\text{Fe}_2\text{Cl}_6$ .
25	15.54	280.0	73.69	66	29.2	525.9	84.03
			Solid Phase, $\text{Fe}_2\text{Cl}_6 \cdot 5\text{H}_2\text{O}$ .	75	28.42	511.4	83.66
12	12.87	231.8	69.87	80	29.20	525.9	84.03
27	14.85	267.5	72.78	100	29.75	535.8	84.26

**SOLUBILITY OF FERRIC CHLORIDE IN AQUEOUS SOLUTIONS OF  
AMMONIUM CHLORIDE AT 25°, 35°, AND 45°.**  
(Mohr — Z. physik. Chem. 27, 197, '98.)

Results at 25°. Results at 35°. Results at 45°.

Mols. per 100 Mols. $\text{H}_2\text{O}$ .		Mols. per 100 Mols. $\text{H}_2\text{O}$ .		Mols. per 100 Mols. $\text{H}_2\text{O}$ .		Solid Phase in Each Case.
$\text{NH}_4\text{Cl}$ .	$\text{Fe}_2\text{Cl}_6$ .	$\text{NH}_4\text{Cl}$ .	$\text{Fe}_2\text{Cl}_6$ .	$\text{NH}_4\text{Cl}$ .	$\text{Fe}_2\text{Cl}_6$ .	
0	10.98	0	13.36	0.0	33.4	$\text{Fe}_2\text{Cl}_6 \cdot 12\text{H}_2\text{O}$ (5 $\text{H}_2\text{O}$ at 45°)
1.57	10.74	1.41	13.05	...	...	Hydrate + Double Salt
2.48	9.02	3.08	9.28	4.08	9.58	Double Salt
5.28	7.73	6.98	7.64	...	...	"
9.59	6.77	10.76	6.70	13.09	6.31	"
9.83	6.70	11.60	6.52	13.54	6.28	Double Salt + Mixed Crystals
9.65	6.07	12.28	6.08	12.91	5.49	Mixed Crystals
9.93	5.23	11.57	3.98	13.49	4.84	"
9.92	3.97	11.89	3.38	13.46	4.99	"
10.31	2.05	13.23	1.38	...	...	"
13.30	0.0	14.79	0.0	16.28	0.0	$\text{NH}_4\text{Cl}$



# IRON CHLORIDE

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## SOLUBILITY OF FERRIC CHLORIDE IN AQUEOUS SOLUTIONS OF AMMONIUM CHLORIDE AT 15°.

(Roozeboom — Z. physik. Ch. 19, 148, '92.)

Mols. per 100 Mols. H <sub>2</sub> O.		Grams per 100 Gms. H <sub>2</sub> O.		Solid Phase.
NH <sub>4</sub> Cl.	FeCl <sub>3</sub> .	NH <sub>4</sub> Cl.	FeCl <sub>3</sub> .	
0.0	9.30	0.0	83.88	Fe <sub>2</sub> Cl <sub>6</sub> .12H <sub>2</sub> O
1.09	9.57	3.24	86.32	"
1.36	9.93	4.03	91.61	Fe <sub>2</sub> Cl <sub>6</sub> .12H <sub>2</sub> O + Double Salt
2.00	9.27	5.92	83.64	Double Salt
2.79	8.71	8.31	78.77	"
4.05	8.09	12.08	73.20	"
6.41	7.18	19.12	64.83	"
10.78	6.21	32.04	56.00	"
7.82	6.75	23.21	60.83	Mixed Crystals containing 7.29% FeCl <sub>3</sub>
7.62	5.94	22.63	53.47	" " 5.55 "
7.70	5.03	22.90	45.42	" " 4.4 "
7.81	4.34	23.23	39.13	" " 3.8 "
8.52	2.82	25.33	25.43	" " 1.64 "
10.95	0.68	32.55	6.15	" " 0.31 "
11.88	0.0	35.30	0.0	NH <sub>4</sub> Cl

## SOLUBILITY OF FERRIC CHLORIDE IN AQUEOUS HYDROCHLORIC ACID SOLUTIONS AT DIFFERENT TEMPERATURES.

(Roozeboom and Schreinemaker — Z. physik. Chem. 15, 633, '94.)

Mols. per 100 Mols. H <sub>2</sub> O.		Gms. per 100 Gms. H <sub>2</sub> O.		Solid Phase.	Mols. per 100 Mols. H <sub>2</sub> O.		Gms. per 100 Gms. H <sub>2</sub> O.		Solid Phase.		
HCl.	FeCl <sub>3</sub> .	HCl.	FeCl <sub>3</sub> .		HCl.	FeCl <sub>3</sub> .	HCl.	FeCl <sub>3</sub> .			
Results at 0°.					Results at 25° (con.).						
0	8.25	0	74.30	Fe <sub>2</sub> Cl <sub>6</sub> .12H <sub>2</sub> O	0.0	20.00	0.0	261.1	Fe <sub>2</sub> Cl <sub>6</sub> .5H <sub>2</sub> O		
7.52	6.51	15.22	58.62		7.5	29.75	15.18	267.9			
13.37	6.33	27.06	57.01		19.5	35.25	39.46	317.4			
16.80	8.70	33.99	78.34		19.5	35.25	39.46	317.4			
18.45	10.23	37.34	92.10		20.6	35.34	41.68	318.3	Fe <sub>2</sub> Cl <sub>6</sub> .4H <sub>2</sub> O		
20.40	15.40	41.28	138.7		31.34	41.58	63.42	374.4			
20.10	16.00	40.67	144.1		33.00	43.00	66.77	387.3			
19.95	17.70	40.37	159.4		34.65	44.80	70.11	403.4			
19.00	22.75	38.45	204.8		40.41	40.25	81.77	362.4	Fe <sub>2</sub> Cl <sub>6</sub> .2HCl + 4H <sub>2</sub> O		
18.05	23.41	36.53	210.8		39.03	41.38	78.98	372.7			
18.05	23.40	36.53	210.8		35.74	45.24	72.33	407.4			
19.50	25.93	39.55	233.5		Results at 40°.						
24.12	30.04	48.81	270.5	Fe <sub>2</sub> Cl <sub>6</sub> .5H <sub>2</sub> O	0	32.4	0.0	291.7	Fe <sub>2</sub> Cl <sub>6</sub> .5H <sub>2</sub> O		
26.00	32.16	52.60	280.6		13.4	37.45	27.11	337.3			
26.00	32.16	52.60	280.6		13.4	37.45	27.11	337.3		Fe <sub>2</sub> Cl <sub>6</sub> .4H <sub>2</sub> O	
34.60	38.11	70.01	343.2		27.0	50.80	54.64	457.5			
37.27	36.60	75.41	329.6	Fe <sub>2</sub> Cl <sub>6</sub> .2HCl + 4H <sub>2</sub> O	0	58.0	0.0	522.3	Fe <sub>2</sub> Cl <sub>6</sub>		
34.60	38.11	70.01	343.2		27	50.8	54.64	457.5			
Results at 25°.					42.01	48.64	85.00	438.0			
0.0	10.90	0.0	98.15	Fe <sub>2</sub> Cl <sub>6</sub> .12.H <sub>2</sub> O	42.50	47.52	86.72	428.0		Fe <sub>2</sub> Cl <sub>6</sub> .2HCl + 4H <sub>2</sub> O	
2.33	23.72	4.715	213.6		42.01	48.64	85.00	438.0			
0.0	24.5	0.0	220.7		Results for other temperatures are also given in the original paper.						
0.0	23.5	0.0	211.6								
2.33	23.72	4.715	213.4	Fe <sub>2</sub> Cl <sub>6</sub> .7H <sub>2</sub> O							
7.50	29.75	15.18	267.9								
0.0	31.50	0.0	283.6								

SOLUBILITY OF THE SALT PAIR  $\text{FeCl}_3\text{NaCl}$  IN WATER AT  $21^\circ$ .

(Hinrichsen and Sachse — Z. physik. Chem. 50, 94, '04-'05.)

Grams Used.		Gms. per 100 Gms. Solution.		G. Mols. per 100 Mols. $\text{H}_2\text{O}$ .		Solid Phase.
$\text{FeCl}_3$ .	$\text{NaCl}$ .	$\text{FeCl}_3$ .	$\text{NaCl}$ .	$\text{FeCl}_3$ .	$\text{NaCl}$ .	
0	3.6	0	36.10	0	11.2	$\text{NaCl}$
1.8	3.0	24.27	9.10	2.69	2.8	Mix Crystals
3.6	2.5	25.40	8.45	2.81	2.6	"
5.5	2.0	26.40	5.25	2.93	2.54	"
7.2	1.5	38.15	3.90	4.23	1.22	"
9.0	1.0	45.38	2.45	5.03	0.75	"
10.8	0.5	46.75	2.11	5.18	0.65	"
10.8	0.0	83.39	0.0	9.3	0.0	$\text{FeCl}_3$

SOLUBILITY OF THE SALT PAIR  $\text{FeCl}_3\text{KCl}$  IN WATER AT  $21^\circ$ .

(H. and S.)

Grams Used.		Gms. per 100 Gms. Solution.		Gm. Mols. per 100 Mols. $\text{H}_2\text{O}$ .		Solid Phase.
$\text{FeCl}_3$ .	$\text{KCl}$ .	$\text{FeCl}_3$ .	$\text{KCl}$ .	$\text{FeCl}_3$ .	$\text{KCl}$ .	
0	35	0	34.97	0	8.45	$\text{KCl}$
13	28	13.44	24.45	1.49	5.90	Mix Crystals
18	21	23.18	16.54	2.57	3.99	"
23	18.5	28.05	11.69	3.11	2.82	"
28	16	35.72	11.68	3.96	2.82	"
31	10.5	36.62	11.19	4.06	2.70	Double Salt
36.2	9	37.35	13.67	4.14	3.30	"
46.5	6	51.69	7.54	5.73	1.82	"
15.5	0	83.89	0.0	9.3	0.0	$\text{FeCl}_3$

SOLUBILITY OF THE SALT PAIR  $\text{FeCl}_3\text{CsCl}$  IN WATER AT  $21^\circ$ .

(H. and S.)

Grams Used.		Gms. per 100 Gms. Solution.		Gm. Mols. per 100 Mols. $\text{H}_2\text{O}$ .		Solid Phase.
$\text{FeCl}_3$ .	$\text{CsCl}$ .	$\text{FeCl}_3$ .	$\text{CsCl}$ .	$\text{FeCl}_3$ .	$\text{CsCl}$ .	
0	65	0.0	65.0	0.0	6.95	$\text{CsCl}$
0.6	11.6	0.45	55.18	0.05	5.9	$\text{FeCl}_3\text{CsCl}\cdot\text{H}_2\text{O}$
1.4	10.2	2.1	52.38	0.23	5.6	"
2.2	8.8	5.24	51.44	0.57	5.5	"
2.0	7.4	7.8	47.70	0.86	5.1	$\text{FeCl}_3\cdot 2\text{CsCl}\cdot\text{H}_2\text{O}$
3.8	6.0	8.93	41.15	0.99	4.4	"
4.6	4.6	15.34	25.25	1.70	2.7	"
5.4	2.8	21.65	14.96	2.40	1.6	"
6.2	1.4	27.96	8.42	3.10	0.9	"
35.0	0.2	48.71	0.94	5.40	0.1	"
35.0	0.0	83.89	0.0	9.3	0.0	$\text{FeCl}_3$

100 gms. abs. acetone dissolve 62.9 gms.  $\text{FeCl}_3$  at  $18^\circ$ .

(Naumann — Ber. 37, 4332, '04.)

# IRON NITRATE

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## IRON NITRATE (Ferrous) $\text{Fe}(\text{NO}_3)_2$ .

### SOLUBILITY IN WATER.

(Funk — Wism. Abh. p. t. Reichenstalt 3, 432, '00.)

t°.	Gms. $\text{Fe}(\text{NO}_3)_2$ per 100 Gms. Sol.	Mols. $\text{Fe}(\text{NO}_3)_2$ per 100 Mols. $\text{H}_2\text{O}$ .	Solid Phase.	t°.	Gms. $\text{Fe}(\text{NO}_3)_2$ per 100 Gms. Sol.	Mols. $\text{Fe}(\text{NO}_3)_2$ per 100 Mols. $\text{H}_2\text{O}$ .	Solid Phase.
-27	35.66	5.54	$\text{Fe}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$	-9	39.68	6.57	$\text{Fe}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$
-21.5	36.10	5.64	"	0	41.53	7.10	"
-19	36.56	5.76	"	18	45.14	8.23	"
-15.5	37.17	5.91	"	24	46.51	8.70	"
				60.5	62.50	16.67	"

Density of solution saturated at 18° = 1.497.

## IRON OXIDES, HYDROXIDE and SULPHIDE.

### SOLUBILITY IN AQUEOUS SUGAR SOLUTIONS.

(Stolle — Z. Ver Zuckerind. 50, 340, '00.)

% Sugar in Solvent.	$\text{Fe}_2(\text{OH})_6$ at:			One Liter of Sugar Solutions Dissolves Milligrams of:			$\text{Fe}_2\text{O}_3$ at:			$\text{FeS}$ at:		
	17.4°.	45°.	75°.	17.5°.	45°.	75°.	17.5°.	45°.	75°.	17.5°.	45°.	75°.
10	3.4	3.4	6.1	1.4	2.0	10.3	10.3	12.4	3.8	3.8	5.3	
30	2.3	2.7	3.8	1.4	...	12.4	10.3	12.4	7.1	9.1	7.2	
50	2.3	1.9	3.4	0.8	1.1	14.5	10.3	14.5	9.9	19.8	9.1	

## IRON PHOSPHATE $\text{Fe}_2(\text{PO}_4)_3$ .

### THE ACTION OF WATER AND OF AQUEOUS SALT SOLUTIONS UPON FERRIC PHOSPHATE.

(Lachowicz — Monatsh. Chem. 13, 357, '92; Cameron and Hurst — J. Am. Chem. Soc. 26, 888, '04.)

The experiments show that the ordinary precipitation methods for the production of ferric phosphate give products which do not conform to the formula  $\text{Fe}_2(\text{PO}_4)_3$ . By digesting such samples with water very little is dissolved, but the material is decomposed to an extent depending upon the relative amounts of solid and solvent used. The amount of  $\text{PO}_4$  dissolved per gram of  $\text{Fe}_2(\text{PO}_4)_3$  varies from about 0.0026 gram removed by 5 cc.  $\text{H}_2\text{O}$  to 0.0182 gram removed by 800 cc.  $\text{H}_2\text{O}$  at the ordinary temperature.

## IRON SULPHATE (Ferrous) $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ .

### SOLUBILITY IN WATER.

(Fränckel — Heidelberg '05, Landolt and Börnstein's Tabellen, 3d ed. p. 537, '06.)

t°.	Gms. $\text{FeSO}_4$ per 100 Gms. $\text{H}_2\text{O}$ .	Solid Phase.	t°.	Gms. $\text{FeSO}_4$ per 100 Gms. $\text{H}_2\text{O}$ .	Solid Phase.
-1.82	14.98	$\text{Ice} + \text{FeSO}_4 \cdot 7\text{H}_2\text{O}$	56.6	54.58	$\text{FeSO}_4 \cdot 7\text{H}_2\text{O} + \text{FeSO}_4 \cdot 4\text{H}_2\text{O}$
0	15.62	$\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$	60	55.02	$\text{FeSO}_4 \cdot 4\text{H}_2\text{O}$
10	20.85	"	70	56.04	"
20	26.42	"	75.8	56.8	$\text{FeSO}_4 \cdot 4\text{H}_2\text{O} + \text{FeSO}_4 \cdot \text{H}_2\text{O}$
30	33.00	"	80	50.6	$\text{FeSO}_4 \cdot \text{H}_2\text{O}$
40	40.20	"	90	43.0	"
50	48.55	"			

100 grams sat. solution in Glycol contain 6.0 grams  $\text{FeSO}_4$  at ordinary temperature. (de Coninck.)

# 161 IRON POTASSIUM SULPHATE

## IRON POTASSIUM SULPHATE (Ferrous) $\text{FeSO}_4 \cdot \text{K}_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$ .

SOLUBILITY IN WATER.  
(Tobler — Liebig's Ann. 95, 193, '55.)

t°.	Gms. $\text{K}_2\text{Fe}(\text{SO}_4)_2$ per 100 Grams $\text{H}_2\text{O}$ .	t°.	Gms. $\text{K}_2\text{Fe}(\text{SO}_4)_2$ per 100 Grams $\text{H}_2\text{O}$ .
0	19.6	35	41.0
10	24.5	40	45.0
14.5	29.1	55	56.0
16	30.9	65	57.3
25	36.5	70	64.2

## SOLUBILITY OF MIXTURES OF FERROUS SULPHATE $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ AND SODIUM SULPHATE $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$ IN WATER.

(Koppel — Z. physik. Chem. 52, 405, '05.)

t°.	Gms. per 100 Gms. Solution.		Gms. per 100 Gms. $\text{H}_2\text{O}$ .		Solid Phase.
	$\text{FeSO}_4$ .	$\text{Na}_2\text{SO}_4$ .	$\text{FeSO}_4$ .	$\text{Na}_2\text{SO}_4$ .	
0	14.54	4.93	18.06	6.11	$\text{FeSO}_4 \cdot 7\text{H}_2\text{O} + \text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$
15.5	17.76	11.32	25.05	15.97	" "
21.8	16.57	15.32	24.34	22.51	$\text{FeNa}_2(\text{SO}_4)_2 \cdot 4\text{H}_2\text{O}$
24.92	16.21	15.13	23.62	22.04	"
35	16.35	14.98	23.91	21.83	"
40	16.37	15.42	24.01	22.62	"
18.8	18.13	13.8	26.63	20.28	$\text{FeNa}_2(\text{SO}_4)_2 \cdot 4\text{H}_2\text{O} + \text{FeSO}_4 \cdot 7\text{H}_2\text{O}$
23	19.58	12.5	28.82	18.4	" "
27	20.97	11.3	30.95	16.64	" "
31	22.91	9.71	33.99	14.41	" "
35	23.85	9.26	35.61	13.85	" "
40	26.32	7.85	39.98	11.92	" "
18.8	18.23	14.83	27.23	22.16	$\text{FeNa}_2(\text{SO}_4)_2 \cdot 4\text{H}_2\text{O} + \text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$
23	13.83	18.04	20.31	26.48	"
28	7.66	24.41	11.28	35.94	" "
31	4.58	29.50	6.95	44.75	" "
35	4.04	30.49	6.16	46.58	$\text{FeNa}_2\text{SO}_4 \cdot 4\text{H}_2\text{O} + \text{Na}_2\text{SO}_4$
40	4.10	30.60	6.27	46.99	" "

**LANTHANUM BROMATE** 162**LANTHANUM BROMATE**  $\text{La}(\text{BrO}_3)_3 \cdot 9\text{H}_2\text{O}$ .100 gms.  $\text{H}_2\text{O}$  dissolve 28.5 gms. lanthanum bromate at  $15^\circ$ .

(Marignac.)

**LANTHANUM SULPHATE**  $\text{La}_2(\text{SO}_4)_3$ .

## SOLUBILITY IN WATER.

(Muthmann and Rölig — Ber. 31, 1723, '98.)

t°.	Gms. $\text{La}_2(\text{SO}_4)_3$ per 100 Gms.		t°.	Gms. $\text{La}_2(\text{SO}_4)_3$ per 100 Gms.	
	Solution.	Water.		Solution.	Water.
0	2.91	3.0	50	1.47	1.5
14	2.53	2.6	75	0.95	0.96
30	1.86	1.9	100	0.68	0.69

**LEAD** Pb.

## MUTUAL SOLUBILITY OF LEAD AND ZINC.

(Spring and Romanoff — Z. anorg. Chem. 13, 34, '06.)

t°.	Upper Layer.		Lower Layer.		t°.	Upper Layer.		Lower Layer.	
	%Pb.	%Zn.	%Pb.	%Zn.		%Pb.	%Zn.	%Pb.	%Zn.
334	98.8	1.2	...	...	650	83.0	17.0	7.0	93.0
419	...	...	1.5	98.5	740	79.0	21.0	10.0	90.0
450	92.0	8.0	...	...	800	75.0	25.0	14.0	86.0
475	91.0	9.0	2.0	98.0	900	59.0	41.0	25.5	74.5
584	86.0	14.0	5.0	95.0	910-920 (crit. temp.)				

**LEAD ACETATE**  $\text{Pb}(\text{C}_2\text{H}_3\text{O}_2)_2 \cdot 3\text{H}_2\text{O}$ .

## SOLUBILITY IN SEVERAL SOLVENTS.

(U. S. P.)

Solvent.	Grams $\text{Pb}(\text{C}_2\text{H}_3\text{O}_2)_2$ per 100 Grams Solvent at:	
	25°.	b. pt.
Water	50	200
Alcohol	3.3	100
Alcohol (0.941 Sp. Gr.)	12.5 (per 100 cc. at $15.5^\circ$ )	
Glycerine	20.0 ( $15^\circ$ )	

**LEAD BENZOATE**  $\text{Pb}(\text{C}_7\text{H}_5\text{O}_2)_2 \cdot \text{H}_2\text{O}$ .

## SOLUBILITY IN WATER.

(Paietta — Gazz. chim. ital. 36, II, 67, '06.)

t°.	18°.	40.6°.	49.5°.
Gms. $\text{Pb}(\text{C}_7\text{H}_5\text{O}_2)_2 \cdot \text{H}_2\text{O}$ per 100 gms. sat. solution	0.149	0.249	0.310

**LEAD BROMATE**  $\text{Pb}(\text{BrO}_3)_2 \cdot \text{H}_2\text{O}$ .

100 gms. cold water dissolve 1.33 gms. lead bromate.

(Rammelsberg — Pogg. Annalen. 52, 96, '41; Böttger — Z. physik. Chem. 46, 602, '03.)

**LEAD BROMIDE**  $\text{PbBr}_2$ .

**SOLUBILITY IN WATER.**  
(Lichty — J. Am. Chem. Soc. 25, 474, '03.)

t°.	Density of Solutions, $\text{H}_2\text{O}$ at 0°.	Gms. $\text{PbBr}_2$ per 100		Milligram Mols. $\text{PbBr}_2$ per 100	
		cc. Solution.	Gms. $\text{H}_2\text{O}$ .	cc. Solution.	Gms. $\text{H}_2\text{O}$ .
0	1.0043	0.4554	0.4554	1.242	1.242
15	1.0053	0.7285	0.7305	1.987	1.989
25	1.0061	0.9701	0.9744	2.646	2.655
35	1.0060	1.3124	1.3220	3.577	3.603
45	1.0059	1.7259	1.7457	4.705	4.760
55	1.0046	2.1024	2.1376	5.731	5.827
65	1.0028	2.516	2.574	6.859	7.016
80	1.0000	3.235	3.343	8.819	9.113
95	0.9995	4.1767	4.3613	11.386	11.890
100	...	4.550	4.751	12.40	12.94

**SOLUBILITY OF LEAD BROMIDE IN AQUEOUS HYDROBROMIC ACID**  
AT 10°.

100 grams  $\text{H}_2\text{O}$  containing 72.0 grams  $\text{HBr}$  dissolve 55.0 grams  $\text{PbBr}_2$ , per 100 gms. solvent, and solution has Sp. Gr. 2.06.

(Ditte — Compt. rend. 92, 719, '81.)

**LEAD CARBONATE**  $\text{PbCO}_3$ .

**SOLUBILITY IN WATER BY ELECTRICAL CONDUCTIVITY METHOD.**

(Kohlrausch and Rose — Z. physik. Chem. 12, 241, '93; Böttger — *Ibid.* 46, 602, '03.)

1 liter of water dissolves 0.0011 — 0.0017 gram  $\text{PbCO}_3$ , at 20°.

**LEAD CHLORATE**  $\text{Pb}(\text{ClO}_3)_2$ .

100 grams  $\text{H}_2\text{O}$  dissolve 151.3 grams  $\text{Pb}(\text{ClO}_3)_2$ , or 100 grams sat. solution contain 60.2 gms.  $\text{Pb}(\text{ClO}_3)_2$ , at 18°. Density of solution, 1.947.

(Mylus and Funk — Ber. 30, 1718, '97.)

**LEAD CHLORIDE**  $\text{PbCl}_2$ .

**SOLUBILITY IN WATER.**

(Lichty; see also Formanek — Chem. Centr. 18, 270, '87; Bell — Chem. News, 16, 69, '67; Ditte — Compt. rend. 92, 718, '81.)

t°.	Density of Solutions, $\text{H}_2\text{O}$ at 0°.	Gms. $\text{PbCl}_2$ per 100		Milligram Mols. $\text{PbCl}_2$ per 100	
		cc. Solution.	Gms. $\text{H}_2\text{O}$ .	cc. Solution.	Grams $\text{H}_2\text{O}$ .
0	1.0066	0.6728	0.6728	2.421	2.421
15	1.0069	0.9070	0.9090	3.265	3.272
25	1.0072	1.0786	1.0842	3.882	3.903
35	1.0060	1.3150	1.3244	4.733	4.767
45	1.0042	1.5498	1.5673	5.579	5.644
55	1.0020	1.8019	1.8263	6.486	6.573
65	0.9993	2.0810	2.1265	7.490	7.651
80	0.9947	2.5420	2.6224	9.150	9.439
95	0.9894	3.0358	3.1654	10.926	11.394
100	...	3.208	3.342	11.52	12.01

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(At 0°, Engel — Ann. chim. phys. [6] 17, 359, '89; at 25°, Noyes — Z. physik. Chem. 9, 623, '92; at different temperatures, Ditte — Compt. rend. 92, 718, '81; see also Bell — J. Chem. Soc. 21, 350, '68.)

Gms. HCl per Liter.	Gms. PbCl <sub>2</sub> per Liter at:		Gms. HCl per 100 Gms. H <sub>2</sub> O.	Gms. PbCl <sub>2</sub> per 100 Gms. Solution at:				
	0°.	25°.		0°.	20°.	40°.	55°.	80°.
0	5.83	10.79	0	8.0	11.8	17.0	21.0	31.0
0.5	4.5	9.0	100	1.2	1.4	3.2	5.5	12.0
1.0	3.6	7.6	150	1.5	2.0	5.0	7.5	16.0
2.0	2.2	6.0	200	3.5	5.0	8.2	11.7	21.5
3.0	1.6	5.0	250	6.5	8.0	13.0	16.2	28.5
6	1.4	3.1	300	10.7	12.5	17.5	22.0	35.0
10	1.2	1.8	400	21.5	24.0	...	...	...
100	1.2	...						
200	5.2	...						
250	10.5	...						
300	17.5	...						
400	40.0	...						

(Noyes; in  $\text{HgCl}_2$  solutions at  $20^\circ$ , Formanek — Chem. Centralb. 270, '87.)

HCl, KCl, MgCl <sub>2</sub> , CaCl <sub>2</sub> , MnCl <sub>2</sub> , and ZnCl <sub>2</sub> Gram Equivalents per Liter of:		In CaCl <sub>2</sub> Gram Equiv. per Liter.		In HgCl <sub>2</sub> Gram Equiv. per Liter.		In Pb(NO <sub>3</sub> ) <sub>2</sub> Gram Equiv. per Liter.	
Salt.	PbCl <sub>2</sub> .	CdCl <sub>2</sub> .	PbCl <sub>2</sub> .	HgCl <sub>2</sub> .	PbCl <sub>2</sub> .	Pb(NO <sub>3</sub> ) <sub>2</sub> .	PbCl <sub>2</sub> .
0.0	0.0777	0.00	0.0777	0.0	0.0777	0.0	0.0777
0.05	0.050	0.05	0.0601	0.1	0.0992	0.2	0.0832
0.10	0.035	0.10	0.0481				
0.20	0.021	0.20	0.0355				

The above results were calculated to grams per liter plotted on cross-section paper, and the figures in the following table read from the curves.

[illegible]

## SOLUBILITY OF LEAD CHLORIDE IN GLYCERINE.

(Presse — Ber. 7, 599, '74.)

1 part glycerine + 7 parts  $H_2O$  dissolve 0.91 per cent  $PbCl_2$ .  
 1 part glycerine + 3 parts  $H_2O$  dissolve 1.04 per cent  $PbCl_2$ .  
 1 part glycerine + 1 part  $H_2O$  dissolves 1.32 per cent  $PbCl_2$ .  
 Pure glycerine dissolves 2.00 per cent  $PbCl_2$ .

LEAD CHROMATE  $PbCrO_4$ .

One liter of water dissolves 0.0002 gram  $PbCrO_4$  at  $18^\circ$  (conductivity method).  
 (Kohlrausch — Z. physik. Chem. 50, 365, '04-'05.)

## SOLUBILITY OF LEAD CHROMATE IN AQUEOUS POTASSIUM HYDROXIDE SOLUTIONS.

(Leland and Lepierre — Bull. soc. chim. [3] 6, 230, '91.)

$t^\circ$ .	Grams KOH per 100 cc.	Grams $PbCrO_4$ per 100 cc.
15	2.308	1.19
60	2.308	1.62
80	2.308	2.61
102	2.308	3.85

LEAD CITRATE  $Pb(C_6H_5O_7)_2 \cdot H_2O$ .

## SOLUBILITY IN WATER AND IN ALCOHOL.

100 gms.  $H_2O$  dissolve 0.04201 gm.  $Pb(C_6H_5O_7)_2 \cdot H_2O$  at  $18^\circ$ , and 0.05344 gm. at  $25^\circ$ .

100 gms. alcohol (95%) dissolve 0.0156 gm.  $Pb(C_6H_5O_7)_2 \cdot H_2O$  at  $18^\circ$ , and 0.0167 gm. at  $25^\circ$ .  
 (Partheil and Hübner — Archiv. Pharm. 241, 413, '03.)

## LEAD DOUBLE CYANIDES.

## SOLUBILITY IN WATER.

(Schuler — Sitzber. Akad. Wiss. Wien, 79, 302, '79.)

Double Salt.	Formula.	$t^\circ$ .	Gms. per 100 Gms. $H_2O$ .
Lead Cobalticyanide	$Pb_2[Co(CN)_6]_3 \cdot 7H_2O$	18	56.5
Lead Cobalticyanide	$Pb_2[Co(CN)_6]_2 \cdot 7H_2O$	19	61.3
Lead Potassium Cobalticyanide	$PbKCo(CN)_6 \cdot 3H_2O$	18	14.8
Lead Cobalticyanide Nitrate	$Pb_2[Co(CN)_6]_2 \cdot Pb(NO_3)_2 \cdot 12H_2O$	18	5.9
Lead Ferricyanide Nitrate	$Pb_2[Fe(CN)_6]_2 \cdot Pb(NO_3)_2 \cdot 12H_2O$	16	7.5
Lead Potassium Ferricyanide	$PbKFe(CN)_6 \cdot 3H_2O$	16	21.0

LEAD FLUORIDE  $PbF_2$ .

One liter of water dissolves 0.64 gram  $PbF_2$  at  $18^\circ$  (conductivity method).  
 (Kohlrausch — Z. physik. Chem. 50, 365, '04-'05.)

LEAD FORMATE  $Pb(HCOO)_2$ .SOLUBILITY OF LEAD FORMATE IN AQUEOUS SOLUTIONS OF BARIUM FORMATE AT  $25^\circ$ .

(Fock — Z. Kryst. Min. 28, 383, '97.)

Mol. % in Solution.		Grams per Liter.		Sp. Gr. of Solutions.	In Solid Phase Mol. % of	
$Pb(HCO_2)_2$ .	$Ba(HCO_2)_2$ .	$Pb(HCO_2)_2$ .	$Ba(HCO_2)_2$ .		$Pb(HCO_2)_2$ .	$Ba(HCO_2)_2$ .
0.00	100.0	...	28.54	1.2204	0.0	100
0.29	99.71	1.104	28.65	1.2213	1.72	98.28
0.74	99.26	2.803	28.90	1.2251	5.29	94.71
1.24	98.76	5.309	32.24	1.2529	11.94	88.06
2.91	97.09	11.42	29.29	1.2341	24.81	75.19
5.92	94.08	23.11	28.13	1.2355	56.54	43.46
100.00	0.0	28.35	...	1.0911	100.0	0.0



**LEAD HYDROXIDE**

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**LEAD HYDROXIDE**  $\text{Pb(OH)}_2$ .**SOLUBILITY OF LEAD HYDROXIDE IN AQUEOUS SOLUTIONS OF SODIUM HYDROXIDE.** (Moist Lead Hydroxide used, temperature not given.)

(Rubenbauer — Z. anorg. Chem. 30, 336, '02.)

Amt. of Na in 20 cc.	Amt. of Pb. in 20 cc.	Mol. Dilution of NaOH.	Grams per 100 cc. Solution.	
			NaOH.	$\text{Pb(OH)}_2$ .
0.2024	0.1012	2.27	1.759	0.590
0.3196	0.1736	1.44	2.778	1.010
0.5866	0.3532	0.785	5.10	2.056
0.9476	0.4071	0.485	8.235	2.370
1.7802	0.5170	0.258	15.470	3.010

**LEAD IODATE**  $\text{Pb(IO}_3)_2$ .One liter of water dissolves 0.019 gm.  $\text{Pb(IO}_3)_2$  at 18°.

(Kohlrausch; Böttger.)

**LEAD IODIDE**  $\text{PbI}_2$ .**SOLUBILITY IN WATER.**

(Lichty — J. Am. Chem. Soc. 25, 471, '03.)

t°.	Density. ( $\text{H}_2\text{O}$ at 0°.)	Grams $\text{PbI}_2$ per 100		Millimols $\text{PbI}_2$ per 100	
		cc. Solution.	Grams $\text{H}_2\text{O}$ .	cc. Solution.	Grams $\text{H}_2\text{O}$ .
0	1.0006	0.0442	0.0442	0.096	0.096
15	0.9998	0.0613	0.0613	0.133	0.133
25	0.9980	0.0762	0.0764	0.165	0.166
35	0.9951	0.1035	0.1042	0.224	0.226
45	0.9915	0.1440	0.1453	0.312	0.315
55	0.9872	0.1726	0.1755	0.374	0.381
65	0.9827	0.2140	0.2183	0.464	0.473
80	0.9745	0.2937	0.3023	0.637	0.656
95	0.9671	0.3814	0.3960	0.828	0.859
100	...	0.420	0.436	0.895	0.927

**SOLUBILITY OF LEAD IODIDE IN ACETONE, ANILIN AND AMYL ALCOHOL.**

(von Laszczynski — Ber. 27, 2285, '94.)

Solvent.	t°.	Grams $\text{PbI}_2$ per 100 Grams Solvent.
$(\text{CH}_3)_2\text{CO}$	59	0.02
$\text{C}_6\text{H}_5\text{NH}_2$	13	0.50
$\text{C}_6\text{H}_5\text{NH}_2$	184	1.10
$\text{C}_5\text{H}_7\text{OH}$	133.5	0.02

# SOLUBILITY OF MIXTURES OF LEAD IODIDE AND POTASSIUM IODIDE IN WATER.

(Ditte — Ann. chim. phys. [5] 24, 226, '81; Schreinemaker — Z. physik. Chem. 9, 65, '92.)

t°.	Grams per 1000 Gms. H <sub>2</sub> O.		Mols. per 1000 Mols. H <sub>2</sub> O.		Solid Phase.
	PbI <sub>2</sub> .	KI.	PbI <sub>2</sub> .	K <sub>2</sub> I <sub>2</sub> .	
5	...	163	...	8.8	Double Salt + PbI <sub>2</sub>
20	9	260	0.3	14.1	" "
28	25	325	0.9	17.6	" "
39	45	449	1.8	24.3	" "
67	255	751	9.9	40.7	" "
80	731	1186	28.5	64.3	" "
80	519.9	976.4	22.2	52.9	" "
104.5	1411	1521	55.1	82.5	" "
120	2151	1812	83.9	98.2	" "
137	2874	2097	112.2	113.8	" "
175	5603	2947	218.7	159.9	" "
189	...	3339	...	181.0	" "
9	96.6	1352	3.77	73.3	Double Salt + KI
13	114.3	1384	4.46	75.05	" "
23	186.3	1510	7.27	81.08	" "
50	526.7	1906	20.56	103.3	" "
64	789.3	2161	30.8	117.2	" "
83.5	1108.6	2434	43.2	131.9	" "
92	1273	2566	49.7	139.3	" "
137	2382	3278	93.0	117.7	" "
165	4187	4227	163.4	229.1	" "
218	10303	...	402.3	...	" "
241	12803	7998	499.9	433.6	" "
242	12749	...	497.8	...	" "
250	15264	...	596.0	...	" "

t°.	Gms. PbI <sub>2</sub> .2KI per 1000 Gms. H <sub>2</sub> O.	Mols. PbI <sub>2</sub> .2KI per 1000 Mols. H <sub>2</sub> O.	Solid Phase.
157	5218	141.07	PbI <sub>2</sub> .2KI.2½H <sub>2</sub> O
172	6489	175.5	"
186	7903	213.7	"
194	9266	250.6	"
201	11320	306.0	"

## LEAD MALATE Pb.C<sub>4</sub>H<sub>4</sub>O<sub>6</sub>.3H<sub>2</sub>O.

### SOLUBILITY IN WATER AND ALCOHOL.

(Parthell and Hübner — Archiv. Pharm. 241, 413, '03.)

100 gms. H<sub>2</sub>O dissolve 0.0288 gm. PbC<sub>4</sub>H<sub>4</sub>O<sub>6</sub>.3H<sub>2</sub>O at 18°, and 0.06504 gm. at 25°.

100 gms. 95% alcohol dissolve 0.0048 gm. PbC<sub>4</sub>H<sub>4</sub>O<sub>6</sub>.3H<sub>2</sub>O at 18°-25°.

Density of alcohol employed = 0.8092.

## LEAD NITRATE

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### LEAD NITRATE $\text{Pb}(\text{NO}_3)_2$ .

#### SOLUBILITY IN WATER.

(Mulder; Kremers — *Pogg. Ann.* 92, 497, '54; at 15°, Michel and Kraft — *Ann. chim. phys.* [3] 42, 471, '54; at 17°, Euler — *Z. physik. Chem.* 49, 314, '04.)

t°.	Grams $\text{Pb}(\text{NO}_3)_2$ per 100 Gms.			t°.	Grams $\text{Pb}(\text{NO}_3)_2$ per 100 Gms.		
	Water.		Solution.		Water.		Solution.
0	36.5 <sup>(1)</sup>	38.8 <sup>(2)</sup>	27.33 <sup>(3)</sup>	40	69.4	75.0	41.9
10	44.4	48.3	31.6	50	78.7	85.0	45.0
17	50.0	54.0	34.2	60	88.0	95.0	47.8
20	52.3	56.5	35.2	80	107.6	115.0	52.7
25	56.4	60.6	36.9	100	127.0	138.8	57.1
30	60.7	66.0	38.8	17°	52.76*		34.54*

\* Euler.

(1) Mulder, (2) Kremers, (3) Average of M and K.

Density of saturated solution at 17° = 1.405. (Euler.)

#### SOLUBILITY OF LEAD NITRATE IN ETHYL AND METHYL ALCOHOL.

Solvent.	Gms. $\text{Pb}(\text{NO}_3)_2$ per 100 Grams Solvent at:				
	4°.	8°.	22°.	40°.	50°.
Aq. $\text{C}_2\text{H}_5\text{OH}$ (Sp. Gr. .9282)	4.96	5.82	8.77	12.8	14.9 (G)
Abs. $\text{C}_2\text{H}_5\text{OH}$	...	...	0.04 (20.5°)	...	... (de B)
Abs. $\text{CH}_3\text{OH}$	...	...	1.37	...	...

(Gerardin — *Ann. chim. phys.* [4] 5, 129, '65; de Bruyn — *Z. physik. Chem.* 10, 783, '92.)

#### SOLUBILITY OF MIXED CRYSTALS OF LEAD NITRATE AND STRONTIUM NITRATE IN WATER AT 25°.

(Fock — *Z. Kryst. Min.* 28, 372, '97.)

Mol. per cent in Solution.		Gms. per 100 cc. Solution.		Sp. Gr. of Solutions.	Mol. per cent in Solid Phase.	
$\text{Pb}(\text{NO}_3)_2$ .	$\text{Sr}(\text{NO}_3)_2$ .	$\text{Pb}(\text{NO}_3)_2$ .	$\text{Sr}(\text{NO}_3)_2$ .		$\text{Pb}(\text{NO}_3)_2$ .	$\text{Sr}(\text{NO}_3)_2$ .
100	0.0	46.31	0.0	1.4472	100	0.0
87.41	12.39	50.47	4.56	1.4336	99.05	0.95
78.68	21.32	53.92	8.14	1.4288	98.11	1.89
56.39	43.61	45.34	17.81	1.4263	97.02	2.98
60.29	39.71	44.48	18.74	1.4245	96.06	3.94
33.70	66.30	25.23	35.03	1.4468	83.84	16.16
24.58	75.42	19.13	37.54	1.4867	32.88	67.12
0.0	100.0	0.0	71.04	1.5141	0.0	100.00

### LEAD OXALATE $\text{PbC}_2\text{O}_4$ .

One liter of water dissolves 0.0015 gm.  $\text{PbC}_2\text{O}_4$  at 18° (conductivity method). (Böttger — *Z. physik. Chem.* 46, 602, '03; Kohlrausch — *Ibid* 50, 356, '04-'05.)

### LEAD OXIDES.

#### SOLUBILITY IN WATER.

(Böttger; Ruer — *Z. anorg. Chem.* 50, 273, '06.)

No.	Description of Oxide.	Gm. Equiv. per Liter.	Gms. per Liter.
1.	Yellow Oxide, by boiling Pb hydroxide with 10% NaOH	$1.03 \times 10^{-4}$	0.023
2.	Red Oxide, by boiling Pb hydroxide with conc. NaOH	$0.56 \times 10^{-4}$	0.012
3.	Yellow Oxide, by heating No. 1 to 630°	$1.05 \times 10^{-4}$	0.023
4.	Yellow Oxide, by heating No. 2 to 740°	$1.00 \times 10^{-4}$	0.022
5.	Yellow Oxide, by heating com. yellow brown oxide to 620°	$1.09 \times 10^{-4}$	0.024
6.	Yellow Brown Oxide commercially pure	$1.10 \times 10^{-4}$	0.024
7.	Yellow Brown Oxide, by long rubbing of No. 5.	$1.12 \times 10^{-4}$	0.025

Böttger gives for three samples of lead oxide, 0.017, 0.021, and 0.013 gm. per liter respectively.

**LEAD PALMITATE, LEAD STEARATE.**

100 cc. absolute ether dissolve 0.0138 gm. palmitate and 0.0148 gm. stearate.

(Lidoff — Bull. soc. chim. [3] 10, 356, '93.)

**LEAD PHOSPHATE (Ortho)  $\text{Pb}_3(\text{PO}_4)_2$ .**

One liter of 4.97 per cent aqueous acetic acid solution dissolves 1.27 gms.  $\text{Pb}_3(\text{PO}_4)_2$ .

(Bertrand — Monit. Scient. [3] 10, 477, '68.)

**LEAD SUCCINATE  $\text{PbC}_4\text{H}_4\text{O}_6$ .****SOLUBILITY IN WATER AND IN ALCOHOL.**

(Partheil and Hübner — Archiv. Pharm. 241, 413, '03.)

100 gms.  $\text{H}_2\text{O}$  dissolve 0.0253 gm.  $\text{PbC}_4\text{H}_4\text{O}_6$  at 18°, and 0.0285 gm. at 25°.

100 gms. 95% alcohol dissolve 0.00275 gm.  $\text{PbC}_4\text{H}_4\text{O}_6$  at 18°, and 0.003 gm. at 25°.

Density of alcohol used = 0.8092.

**LEAD SULPHATE  $\text{PbSO}_4$ .**

One liter of water dissolves 0.041 gm.  $\text{PbSO}_4$ , by conductivity method.

(Kohlrausch; Böttger. Dibbitts — Z. anal. Chem. 13, 139, '74, finds 0.038 gram by gravimetric method.)

**SOLUBILITY OF LEAD SULPHATE IN AQUEOUS SOLUTIONS OF STRONG ACIDS.**

(Schultz — Pogg. Ann. 113, 137, '61; Rodwell — J. Chem. Soc. 15, 59, '62.)

In Aq. $\text{H}_2\text{SO}_4$ .			In Aq. $\text{HCl}$ .			In Aq. $\text{HNO}_3$ .		
(a).	(b).	(c).	(a).	(b).	(c).	(a).	(b).	(c).
1.540	63.4	0.003	1.05	10.6	0.14	1.08	11.6	0.33
1.793	85.7	0.011	1.08	16.3	0.35	1.12	17.5	0.59
1.841	97.0	0.039	1.11	22.0	0.95	1.25	34.0	0.78
			1.14	27.5	2.11	1.42	60.0	1.01
			1.16	31.6	2.86			

(a) Sp. Gr. of Aq. Acid. (b) Gms. Acid per 100 Gms. Solution. (c) Gms.  $\text{PbSO}_4$  per 100 Gms. Solvent.

**SOLUBILITY OF LEAD SULPHATE IN AQUEOUS SOLUTIONS OF AMMONIUM ACETATE AND OF SODIUM ACETATE.**

(Noyes and Whitcomb — J. Am. Chem. Soc. 27, 756, '05; Dunnington and Long — Am. Ch. J. 22, 217, '99; Dibbitts — Z. anal. Chem. 13, 139, '74.)

In Ammonium Acetate.				In Sodium Acetate.			
At 25° (N. and W.).				At 100° (D. and L.).			
Millimols per Liter.		Grams per Liter.		G. $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2$ per 100 cc. Solution.		G. $\text{PbSO}_4$ per 100 g. Solution.	
$\text{NH}_4\text{C}_2\text{H}_3\text{O}_2$ .	$\text{PbSO}_4$ .	$\text{NH}_4\text{C}_2\text{H}_3\text{O}_2$ .	$\text{PbSO}_4$ .			Gms. per 100 $\text{NaC}_2\text{H}_3\text{O}_2$ .	Gms. $\text{H}_2\text{O}$ . $\text{PbSO}_4$ .
0.0	0.134	0.0	0.041	28	7.12	2.05	0.054
103.5	2.10	7.98	0.636	32	9.88	8.2	0.853
207.1	4.55	15.96	1.38	37	10.58	41.0	11.23
414.1	10.10	31.92	3.02	45	11.10		

## LEAD (Hypo) SULPHATE 170

### SOLUBILITY OF MIXTURES OF LEAD HYPOSULPHATE AND STRONTIUM HYPOSULPHATE AT 25°.

(Fock — Z. Kryst. Min. 28, 389, '97.)

Mol. per cent in Solution.		Grams per Liter.		Sp. Gr. of Solutions.	Mol. per cent in Solid Phase.	
PbS <sub>2</sub> O <sub>6</sub> 4H <sub>2</sub> O.	SrS <sub>2</sub> O <sub>6</sub> 4H <sub>2</sub> O.	PbS <sub>2</sub> O <sub>6</sub> .	SrS <sub>2</sub> O <sub>6</sub> .		PbS <sub>2</sub> O <sub>6</sub> 4H <sub>2</sub> O.	SrS <sub>2</sub> O <sub>6</sub> 4H <sub>2</sub> O.
0.0	100.0	0.0	145.6	1.1126	0.0	100.0
1.05	98.95	2.97	151.2	1.1184	0.30	99.7
15.31	84.69	40.82	152.5	1.1503	3.87	96.13
46.80	53.20	149.2	114.5	1.2147	9.84	90.16
62.30	37.70	256.1	85.0	1.2889	19.26	80.74
75.75	24.25	310.3	67.0	1.3252	23.73	76.27
78.09	21.91	373.7	70.8	1.3726	32.24	67.76
88.29	11.71	509.5	45.6	1.4671	49.97	50.13
100.0	0.00	374.3	0.0	1.6817	0.00	0.00

## LEAD TARTRATE PbC<sub>4</sub>O<sub>6</sub>H<sub>4</sub>.

### SOLUBILITY IN WATER.

(Cantoni and Zachoder — Bull. soc. chim. [3] 33, 751, '05; Partheil and Hübner — Archiv. Pharm. 241, 413, '03.)

t°.	Gms. PbC <sub>4</sub> O <sub>6</sub> H <sub>4</sub> per 100 cc. Solution.	t°.	Gms. PbC <sub>4</sub> O <sub>6</sub> H <sub>4</sub> per 100 cc. Solution.	t°.	Gms. PbC <sub>4</sub> O <sub>6</sub> H <sub>4</sub> per 100 cc. Solution.
18	0.010 (P. and H.)	50	0.00225	70	0.0032
25	0.0108 "	55	0.00295	75	0.0033
35	0.00105	60	0.00305	80	0.0038
40	0.0015	65	0.00315	85	0.0054

NOTE. — The positions of the decimal points here shown are just as given in the original communications.

100 gms. alcohol of 0.8092 Sp. Gr. (about 95%) dissolve 0.0028 gm. PbC<sub>4</sub>O<sub>6</sub>H<sub>4</sub> at 18°, and 0.00315 gm. at 25°.

(P. and H.)

## LEVULOSE C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>.

100 gms. saturated solution in pyridine contain 18.49 gms. C<sub>6</sub>H<sub>12</sub>O<sub>6</sub> at 26°, Sp. Gr. 1.0521.

(Holtz — J. Physic. Chem. 9, 764, '05.)

## LIGRÖIN.

100 cc. H<sub>2</sub>O dissolve 0.341 cc. ligröin at 22° Vol. of solution = 100.34, Sp. Gr. 0.9969.

100 cc. ligröin dissolve 0.335 cc. H<sub>2</sub>O at 22° Vol. of solution = 100.60, Sp. Gr. 0.6640.

(Herz — Ber. 31, 2671, '98.)

## LITHIUM BENZOATE C<sub>6</sub>H<sub>5</sub>COOLi.

100 gms. H<sub>2</sub>O dissolve 33.3 gms. at 25°, and 40.0 gms. at b. pt.

100 gms. alcohol dissolve 7.7 gms. at 25°, and 10.0 gms. at b. pt.

(U. S. P.)

## LITHIUM BORATE Li<sub>2</sub>OB<sub>2</sub>O<sub>3</sub>.

### SOLUBILITY IN WATER.

t°	0	10	20	30	40	45
Gms. Li <sub>2</sub> OB <sub>2</sub> O <sub>3</sub> per 100 Gms. H <sub>2</sub> O	0.7	1.4	2.6	4.9	11.12	20

(Le Chatelier — Compt. rend. 124, 1094, '97.)

**LITHIUM BROMATE**  $\text{LiBrO}_3$ .

100 gms.  $\text{H}_2\text{O}$  dissolve 153.7 gms.  $\text{LiBrO}_3$  at  $18^\circ$ , or 100 gms. saturated solution contain 60.4 gms. Sp. Gr. of sol. = 1.833.

(Mylius and Funk — Ber. 30, 1718, '97.)

**LITHIUM BROMIDE**  $\text{LiBr}$ .

SOLUBILITY IN WATER.  
(Kremers — Pogg. Ann. 104, 133, '58.)

t°.	Gms. $\text{LiBr}$ per 100 Gms.		t°.	Gms. $\text{LiBr}$ per 100 Gms.	
	Water.	Solution.		Water.	Solution.
0	143	58.8	40	202	66.9
10	161	61.7	50	214	68.2
20	177	63.9	60	224	69.1
25	184	64.8	80	245	71.0
30	190	65.5	100	266	72.7

100 gms. saturated solution in glycol,  $\text{C}_2\text{H}_4(\text{OH})_2$ ,  $\text{H}_2\text{O}$ , contain 37.5 gms.  $\text{LiBr}$  at  $14.7^\circ$ .

(de Coninck — Chem. Centr. 76, 11, 883, '05.)

**LITHIUM CARBONATE**  $\text{Li}_2\text{CO}_3$ .

SOLUBILITY IN WATER.

(Bevade — J. russ. phys. chem. Ges. 16, 591, 84; Bull. soc. chim. [2] 43, 123, '85; Flückiger — Arch. Pharm. [3] 25, 542, '87; Draper — Chem. News, 55, 169, '87.)

An average curve was constructed from the available results and the following table read from it.

t°.	Gms. $\text{Li}_2\text{CO}_3$ per 100 Gms.		t°.	Gms. $\text{Li}_2\text{CO}_3$ per 100 Gms.	
	Water.	Solution.		Water.	Solution.
0	1.54	1.52	40	1.17	1.16
10	1.43	1.41	50	1.08	1.07
20	1.33	1.31	60	1.01	1.00
25	1.29	1.28	80	0.85	0.84
30	1.25	1.24	100	0.72	0.71

Density of saturated solution at  $0^\circ$  = 1.017; at  $15^\circ$  = 1.014.

SOLUBILITY OF LITHIUM CARBONATE IN AQUEOUS SOLUTIONS OF  
ALKALI SALTS AT  $25^\circ$ .

(Geffcken — Z. anorg. Chem. 43, 197, '05.)

The original results were calculated to gram quantities and plotted on cross-section paper. The figures in the following table were read from the curves.

Gms. Salt per Liter.	Grams $\text{Li}_2\text{CO}_3$ per Liter in Aqueous Solutions of:							
	$\text{KClO}_3$ .	$\text{KNO}_3$ .	$\text{KCl}$ .	$\text{NaCl}$ .	$\text{K}_2\text{SO}_4$ .	$\text{Na}_2\text{SO}_4$ .	$\text{NH}_4\text{Cl}$ .	$(\text{NH}_4)_2\text{SO}_4$ .
0	12.63	12.63	12.63	12.63	12.63	12.63	12.63	12.63
10	12.95	13.05	13.10	13.4	13.9	14.0	16.0	20.7
20	13.10	13.3	13.5	13.9	14.7	15.0	19.2	25.0
30	13.25	13.6	13.8	14.3	15.4	16.0	21.5	28.2
40	13.40	13.8	14.0	14.6	16.0	16.6	23.3	30.8
60	...	13.8	14.2	14.5	16.9	17.8	26.0	35.2
80	...	13.6	14.0	14.4	17.7	18.6	27.6	38.5
100	...	13.5	13.9	14.2	18.2	19.4	28.4	41.0
120	...	13.3	13.7	14.0	...	19.9	28.7	42.6
140	...	13.0	13.3	...	...	20.4	28.8	43.5
170	...	12.6	...	...	...	...	28.9	...
200	...	12.2	...	...	...	...	29.0	...

100 gms. aq. alcohol of 0.941 Sp. Gr. dissolve 0.056 gm.  $\text{Li}_2\text{CO}_3$  at  $15.5^\circ$ .

**LITHIUM (Bi) CARBONATE** 172**LITHIUM (Bi) CARBONATE**  $\text{LiHCO}_3$ .

100 grams  $\text{H}_2\text{O}$  dissolve 5.501 grams  $\text{LiHCO}_3$  at  $13^\circ$ .

(Bevade — Ber. 17, R 406, '84.)

**LITHIUM CHLORATE**  $\text{LiClO}_3$ .

100 grams  $\text{H}_2\text{O}$  dissolve 213.5 grams  $\text{LiClO}_3$  at  $18^\circ$ , or 100 grams sat. solution contain 75.8 grams. Sp. Gr. of sol. = 1.815.

(Mylius and Funk — Ber. 30, 1718, '97.)

**LITHIUM CHLORAUATE**  $\text{LiAuCl}_4$ .

## SOLUBILITY IN WATER.

(Rosenblatt — Ber. 19, 2538, '86.)

t °.	Gms. $\text{LiAuCl}_4$ per 100 Gms. Solution.	t °.	Gms. $\text{LiAuCl}_4$ per 100 Gms. Solution.	t °.	Gms. $\text{LiAuCl}_4$ per 100 Gms. Solution.
10	53.1	40	67.3	60	76.4
20	57.7	50	72.0	70	81.0
30	62.5			80	85.7

**LITHIUM CHLORIDE**  $\text{LiCl}$ .

## SOLUBILITY IN WATER.

(Average curve from results of Gerlach — Z. anal. Chem. 8, 281, '69.)

t °.	Gms. $\text{LiCl}$ per 100 Gms.		t °.	Gms. $\text{LiCl}$ per 100 Gms.	
	Water.	Solution.		Water.	Solution.
0	67	40.1	40	90.5	47.5
10	72	41.9	50	97.0	49.2
20	78.5	44.0	60	103.0	51.9
25	81.5	49.9	80	115.0	53.5
30	84.5	45.8	100	127.5	56.0

Density of saturated solution at  $0^\circ$ , 1.255; at  $15^\circ$ , 1.275.

SOLUBILITY OF LITHIUM CHLORIDE IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID AT  $0^\circ$ .

(Engel — Ann. chim. phys. [6] 13, 385, '88.)

Milligram Mols. per 10 cc. Solution.		Gms. per 10 cc. Solution.		Sp. Gr. of Solutions.
$\text{LiCl}$ .	$\text{HCl}$ .	$\text{LiCl}$ .	$\text{HCl}$ .	
120	0.0	51.0	0.0	1.255
97.5	22.5	41.4	8.2	1.243
67.0	66.0	28.5	24.1	1.249
58.0	81.0	24.6	29.5	1.251

## SOLUBILITY OF LITHIUM CHLORIDE IN SEVERAL SOLVENTS.

(von Laszczynski — Ber. 27, 2285, '94; de Coninck — Chem. Centr. 76, II, 883, '05.)

In Acetone. (von L.)				In Pyridine. (von L.)		In Glycol. (de C.)	
t°.	Gms. LiCl per 100 Gms. (CH <sub>3</sub> ) <sub>2</sub> CO.	t°.	Gms. LiCl per 100 Gms. (CH <sub>3</sub> ) <sub>2</sub> CO.	t°.	Gms. LiCl per 100 Gms. C <sub>5</sub> H <sub>5</sub> N.	t°.	Gms. LiCl per 100 Gms. Sat. Sol.
0	4.60	46	3.76	15°	7.78	15°	11.0
12	4.41	53	3.12	100	14.26		
25	4.11	58	2.14				

**LITHIUM CHROMATE**  $\text{Li}_2\text{CrO}_4 \cdot 2\text{H}_2\text{O}$ .**LITHIUM BICHROMATE**  $\text{Li}_2\text{Cr}_2\text{O}_7 \cdot 2\text{H}_2\text{O}$ .

## SOLUBILITY IN WATER AT 30°.

(Schreinemaker — Z. physik. Chem. 55, 79, '06; at 18°, Mylius and Funk — Ber. 30, 1718, '97.)

Composition in Weight per cent:				Solid Phase.
Of Solution. % $\text{CrO}_3$ .	% $\text{Li}_2\text{O}$ .	Of Residue. % $\text{CrO}_3$ .	% $\text{Li}_2\text{O}$ .	
0.0	7.09	...	...	$\text{LiOH} \cdot \text{H}_2\text{O}$
6.986	7.744	4.322	18.538	"
16.564	8.888	10.089	19.556	"
25.811	10.611	15.479	21.106	"
33.618	12.886	24.365	19.398	"
37.411	14.306	44.555	17.411	$\text{LiOH} \cdot \text{H}_2\text{O} + \text{Li}_2\text{CrO}_4 \cdot 2\text{H}_2\text{O}$
37.588	14.381	36.331	18.552	" "
37.495	13.311	51.075	16.384	$\text{Li}_2\text{CrO}_4 \cdot 2\text{H}_2\text{O}$
40.280	10.858	...	...	"
43.404	11.809	53.793	14.070	$\text{Li}_2\text{Cr}_2\text{O}_7 \cdot 2\text{H}_2\text{O} + \text{Li}_2\text{CrO}_4 \cdot 2\text{H}_2\text{O}$
45.130	9.515	56.085	10.190	$\text{Li}_2\text{Cr}_2\text{O}_7 \cdot 2\text{H}_2\text{O}$
47.945	7.951	58.029	9.238	"
57.031	6.432	65.560	8.733	"
67.731	5.713	71.687	8.513	$\text{Li}_2\text{Cr}_2\text{O}_7 \cdot 2\text{H}_2\text{O} + \text{CrO}_3$
67.814	5.689	80.452	3.780	" "
65.200	4.661	...	...	$\text{CrO}_3$
63.257	2.141	85.914	0.758	"
62.28	...	...	...	"

A saturated aqueous solution contains:

49.985 per cent  $\text{Li}_2\text{CrO}_4$ , or 100 grams  $\text{H}_2\text{O}$  dissolve 99.94 grams  $\text{Li}_2\text{CrO}_4$  at 30° (S.).56.6 per cent  $\text{Li}_2\text{Cr}_2\text{O}_7$ , or 100 grams  $\text{H}_2\text{O}$  dissolve 130.4 grams  $\text{Li}_2\text{Cr}_2\text{O}_7$  at 30° (S.).52.6 per cent  $\text{Li}_2\text{CrO}_4$ , or 100 grams  $\text{H}_2\text{O}$  dissolve 110.9 grams  $\text{Li}_2\text{CrO}_4$  at 18° (M. and F.).

Sp. Gr. of sat. solution at 18° = 1.574.

**LITHIUM CITRATE**  $\text{C}_6\text{H}_4(\text{OH})(\text{COOLi})_3$ .100 gms.  $\text{H}_2\text{O}$  dissolve 50 gms. citrate at 25°, and 66.6 gms. at b. pt.

100 gms. alcohol of 0.941 Sp. Gr. dissolve 4 gms. citrate at 15.5°.

(U. S. P.)

**LITHIUM FLUORIDE**  $\text{LiF}$ .100 grams  $\text{H}_2\text{O}$  dissolve 0.27 gram  $\text{LiF}$  at 18°. Sp. Gr. of sol. = 1.003.

(Mylius and Funk.)



# LITHIUM FORMATE

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## LITHIUM FORMATE HCOOLi.

### SOLUBILITY IN WATER.

(Groschuff — Ber. 36, 179, '03.)

t°.	Gms. HCOOLi per 100 Gms. Solution.	Mols. HCOOLi per 100 Mols. H <sub>2</sub> O.	Solid Phase.	t°.	Gms. HCOOLi per 100 Gms. H <sub>2</sub> O.	Mols. HCOOLi per 100 Mols. H <sub>2</sub> O.	Solid Phase.
-20	21.14	9.28	HCOOLi.H <sub>2</sub> O	91	54.16	40.90	HCOOLi.H <sub>2</sub> O
0	24.42	11.18	"	98	57.05	45.99	HCOOLi
18	27.85	13.36	"	104	57.04	47.11	"
49.5	35.60	19.14	"	120	59.63	51.13	"
74	44.91	28.22	"				

Sp. Gr. sat. sol. at 18° = 1.142.

### SOLUBILITY OF NEUTRAL LITHIUM FORMATE IN ANHYDROUS FORMIC ACID.

t°.	Gms. per 100 Gms. Solution.	Gms. per 100 Gms. HCOOH.	Mols. per 100 Mols. H <sub>2</sub> O.	Gms. per 100 Gms. HCOOH.	Solid Phase.
0	25.4	47.02	11.80	39.27	HCOOLi
18	25.9	46.92	12.11	39.11	"
39	26.4	46.92	12.42	39.13	"
60	26.9	46.94	12.74	39.13	"
79	27.8	47.02	13.36	39.26	"

## LITHIUM HYDROXIDE LiOH.

### SOLUBILITY IN WATER.

(Dittmar — J. Soc. Ch. Ind. 7, 730, '88; Pickering — J. Chem. Soc. 63, 909, '93.)

t°	Gms. per 100 Gms. Solution.	Gms. LiOH per 100 Gms. H <sub>2</sub> O.	t°	Gms. per 100 Gms. Solution.	Gms. LiOH per 100 Gms. H <sub>2</sub> O.
	<u>Li<sub>2</sub>O.</u> <u>LiOH.</u>			<u>Li<sub>2</sub>O.</u> <u>LiOH.</u>	
0	6.67 10.64	12.7	40	7.20 11.68	13.0
10	6.74 10.80	12.7	50	7.56 12.12	13.3
20	6.86 10.99	12.8	60	7.96 12.76	13.8
25	6.95 11.14	12.9	80	8.87 14.21	15.3
30	7.05 11.27	12.9	100	10.02 16.05	17.5

## LITHIUM IODATE Li(IO<sub>3</sub>).

100 grams H<sub>2</sub>O dissolve 80.3 grams LiIO<sub>3</sub> at 18°, or 100 grams solution contain 44.6 grams. Sp. Gr. of sol. = 1.568.

(Mylius and Funk — Ber. 30, 1718, '97.)

## LITHIUM IODIDE LiI.

## SOLUBILITY IN WATER.

(Kremers — Pogg. Ann. 104, 133, '58; 111, 60, '60.)

t°.	Gms. LiI per 100 Gms.		t°.	Grams LiI per 100 Gms.	
	Water.	Solution.		Water.	Solution.
0	151	60.2	40	179	64.2
10	157	61.1	50	187	65.2
20	165	62.2	60	202	66.9
25	167	62.6	70	230	69.7
30	171	63.1	75	263	72.5

100 grams sat. solution in Glycol ( $C_2H_4(OH)_2 \cdot H_2O$ ) contain 28.0 grams LiI at 15.3°.

(de Coninck — Chem. Centr. 76, II, 883, '05.)

100 cc. saturated solution in Furfural ( $C_4H_3O \cdot COH$ ) contain 45.86 gms. LiI at 25°.

100 cc. saturated solution in Nitro Methane ( $CH_3NO_2$ ) contain 1.219 gms. LiI at 0°, and 2.519 gms. at 25°.

(Walden — Z. physik. Ch. 55, 713, 718, '06.)

LITHIUM NITRATE  $LiNO_3$ .

## SOLUBILITY IN WATER.

(Donnan and Burt — J. Chem. Soc. 83, 335, '03.)

t°.	Gms. $LiNO_3$ per 100 Gms. Solution.	Solid Phase.	t°.	Gms. $LiNO_3$ per 100 Gms. Solution.	Solid Phase.
0.1	34.8	$LiNO_3 \cdot 3H_2O$	29.87	56.42	$LiNO_3 \cdot 3H_2O$
10.5	37.9	"	29.86	56.68	"
12.1	38.2	"	29.64	57.48	"
13.75	39.3	"	29.55	58.03	"
19.05	40.4	"	43.6	60.8	$LiNO_3 \cdot 3H_2O$
21.1	42.9	"	50.5	61.3	"
27.55	47.3	"	55.0	63.0	"
29.47	53.67	"	60.0	63.6	"
29.78	55.09	"	64.2	64.9	$LiNO_3$
			70.9	66.1	"

Cryohydrate point of the trihydrate, 17.8°. Transition points, 29.6° and 61.1°.

LITHIUM OXALATE  $Li_2C_2O_4$ .

## SOLUBILITY OF MIXTURES OF LITHIUM OXALATE AND OXALIC ACID IN WATER AT 25°.

(Foote and Andrew — Am. Ch. J. 34, 153, '05.)

Mixtures of the two substances were dissolved in water, and the solutions cooled in a thermostat at 25°.

Gms. per 100 Gms. Solution.		Mols. per 100 Mols. $H_2O$ .		Solid Phase.
$H_2C_2O_4$ .	$Li_2C_2O_4$ .	$H_2C_2O_4$ .	$Li_2C_2O_4$ .	
10.20	...	2.274	...	$H_2C_2O_4 \cdot 2H_2O$
10.66	2.96	2.457	0.622	$H_2C_2O_4 \cdot H_2O$ and $HLiC_2O_4 \cdot H_2O$
10.55	3.11	1.823	0.633	Double Salt
8.08	3.18	0.563	0.962	$HLiC_2O_4 \cdot 4H_2O$
2.60	5.03	0.469	1.273	$= 39.2 H_2C_2O_4$ and $44.7 Li_2C_2O_4$
2.16	6.54	...	1.901	$HLiC_2O_4 \cdot H_2O$ and $Li_2C_2O_4$
2.12	1.61	...	1.901	$Li_2C_2O_4$
...	5.87	...	1.901	$Li_2C_2O_4$

**LITHIUM PHOSPHATE**

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**LITHIUM PHOSPHATE**  $\text{Li}_3\text{PO}_4$ .100 grams  $\text{H}_2\text{O}$  dissolve 0.04 gram  $\text{Li}_3\text{PO}_4$ . (Mayer — *Liebig's Ann.* 98, 193, '56.)**LITHIUM (Hypo) PHOSPHATE**  $\text{Li}_4\text{P}_2\text{O}_6 \cdot 7\text{H}_2\text{O}$ .100 grams  $\text{H}_2\text{O}$  dissolve 0.83 gram hypophosphate at ord. temp.  
(Rammelsberg — *J. pr. Ch.* [2] 45, 153, '92.)**LITHIUM PERMANGANATE**  $\text{LiMnO}_4 \cdot 3\text{H}_2\text{O}$ .100 grams water dissolve 71.4 grams permanganate at  $16^\circ$ .  
(Ashoff.)**LITHIUM SALTS** of Fatty Acids.SOLUBILITY IN WATER AND IN ALCOHOL OF 0.797 SP. GR. AT  $18^\circ$   
AND AT  $25^\circ$ .(Partheil and Feric — *Archiv. Pharm.* 241, 554, '03.)

Salt.	Formula.	Grams Salt per 100 cc. Sat. Solution in:			
		Water at		Alcohol at	
		$18^\circ$ .	$25^\circ$ .	$18^\circ$ .	$25^\circ$ .
Stearate	$\text{C}_{17}\text{H}_{35}\text{COOLi}$	0.010	0.011	0.041	0.0532
Palmitate	$\text{C}_{16}\text{H}_{31}\text{COOLi}$	0.011	0.018	0.0796	0.0956
Myristate	$\text{C}_{14}\text{H}_{27}\text{COOLi}$	0.0232	0.0234	0.184	0.2100
Laurinate	$\text{C}_{12}\text{H}_{23}\text{COOLi}$	0.158	0.1726	0.418	0.4424
Oleate	$\text{C}_{17}\text{H}_{33}\text{COOLi}$	0.0674	0.1320	0.9084	1.010

**LITHIUM SULPHATE**  $\text{Li}_2\text{SO}_4$ .

## SOLUBILITY IN WATER.

(Average curve from Kremers — *Pogg. Ann.* 95, 468, '55; Etard — *Ann. chim. phys.* [7] 2, 547, '94.)

$t^\circ$ .	Gms. $\text{Li}_2\text{SO}_4$ per 100 Gms. Solution.	$t^\circ$ .	Gms. $\text{Li}_2\text{SO}_4$ per 100 Gms. Solution.	$t^\circ$ .	Gms. $\text{Li}_2\text{SO}_4$ per 100 Gms. Solution.
-20	18.4	20	25.5	50	24.5
-10	24.2	25	25.3	60	24.2
0	26.1	30	25.1	80	23.5
10	25.9	40	24.7	100	23.0

NOTE. — For equilibrium between lithium sulphate ammonia and water, see Schreinemaker and Cochart — *Chem. Weekblad.* 2, 771; 3, 157, '06.EQUILIBRIUM BETWEEN LITHIUM SULPHATE, ALUMINUM SULPHATE,  
AND WATER AT  $30^\circ$ .(Schreinemaker and De Waal — *Chem. Weekblad.* 3, 539, '06.)

Composition in Weight per cent:

Of Solution.		Of Residue.		Solid Phase.
% $\text{Li}_2\text{SO}_4$ .	% $\text{Al}_2(\text{SO}_4)_3$ .	% $\text{Li}_2\text{SO}_4$ .	% $\text{Al}_2(\text{SO}_4)_3$ .	
25.1	0	...	...	$\text{Li}_2\text{SO}_4 \cdot \text{H}_2\text{O}$
21.93	5.34	...	...	"
16.10	14.89	63.70	4.02	"
13.63	20.76	14.72	31.17	$\text{Li}_2\text{SO}_4 \cdot \text{H}_2\text{O} +$ $\text{Al}_2(\text{SO}_4)_3 \cdot 18\text{H}_2\text{O}$
13.24	21.71	61.24	7.22	$\text{Li}_2\text{SO}_4 \cdot 4\text{H}_2\text{O}$
11.73	22.08	6.92	33.54	$\text{Al}_2(\text{SO}_4)_3 \cdot 18\text{H}_2\text{O}$
6.75	24.34	3.77	37.06	"
3.44	26.12	...	...	"
0.0	28.0	...	...	"

NOTE. — For solubility of lithium sulphate in mixtures of alcohol and water at  $30^\circ$ , see Schreinemaker and Van Dorp, Jr. — *Chem. Weekblad.* 3, 557, '06.

**MAGNESIUM BROMATE**  $\text{Mg}(\text{BrO}_3)_2 \cdot 6\text{H}_2\text{O}$ .

100 cc. sat. solution contain 42 grams  $\text{Mg}(\text{BrO}_3)_2$ , or 0.15 gram mols. at 18°.

(Kohlrausch — Sitzb. K. Akad. Wiss. (Berlin), i, 90, '97.)

**MAGNESIUM BROMIDE**  $\text{MgBr}_2 \cdot 6\text{H}_2\text{O}$ .

## SOLUBILITY IN WATER.

(Menschutkin — Chem. Centr. 77, I, 646, '06; at 18°, Mylius and Fuok — Ber. 30, 1718, '97.)

t°	Grams $\text{MgBr}_2$ per 100 Gms.		t°	Grams $\text{MgBr}_2$ per 100 Grams.	
	Solution.	Water.		Solution.	Water.
-10	47.2	89.4	40	50.4	101.6
0	47.9	91.9	50	51.0	104.1
10	48.6	94.5	60	51.8	107.5
18	49.0	96.1	80	53.2	113.7
18	50.8	103.4 (M. and F.)	100	54.6	120.2
20	49.1	96.5	120	56.0	127.5
25	49.4	97.6	140	58.0	138.1
30	49.8	99.2	160	62.0	163.1

Density of saturated solution at 18° = 1.655 (M. and F.)

Etard — Ann. chim. phys. [7] 2, 541, '94, gives solubility results which are evidently too high.

## SOLUBILITY OF MAGNESIUM BROMIDE ALCOHOL COMPOUNDS IN THE CORRESPONDING ALCOHOLS.

(Menschutkin — Chem. Centr. 77, I, 334, 647, '06.)

## In the Corresponding Alcohols.

t°	Results Expressed in Mols. per cent.	
	$\text{MgBr}_2 \cdot 6\text{CH}_2\text{OH}$ in $\text{CH}_2\text{OH}$ .	$\text{MgBr}_2 \cdot 6\text{C}_2\text{H}_5\text{OH}$ in $\text{C}_2\text{H}_5\text{OH}$ .
0	6.0	2.0
20	6.4	4.6
40	6.9	8.4
50	7.2	10.9
60	7.5	14.1
80	8.25	22.1
100	9.6	38.6
150	16.7	100.0 (108.5°)
190	100.0	

Determinations are also given for the solubility of  $\text{MgBr}_2 \cdot 6\text{C}_2\text{H}_5\text{OH}$  in  $\text{C}_2\text{H}_5\text{OH}$ , of  $\text{MgBr}_2 \cdot 6(\text{CH}_3)_2\text{C}_2\text{H}_5\text{OH}$  in  $(\text{CH}_3)_2\text{C}_2\text{H}_5\text{OH}$ , and of  $\text{MgBr}_2 \cdot 6(\text{CH}_3)_3\text{C}_2\text{H}_5\text{OH}$  in  $(\text{CH}_3)_3\text{C}_2\text{H}_5\text{OH}$ , also of  $\text{MgBr}_2 \cdot 4(\text{CH}_3)_3\text{CHOH}$  in iso propyl alcohol and in tri methyl carbinol.

For the solubility magnesium bromide mono etherate ( $\text{MgBr}_2 \cdot (\text{C}_2\text{H}_5)_2\text{O}$ ) in ethyl ether, see Menschutkin — Chem. Centr. 77, I, 1868, '06; also Z. anorg. Ch. 49, 208, '06. For magnesium bromide di etherate ( $\text{MgBr}_2 \cdot 2\text{C}_2\text{H}_5\text{O}$ ) in ethyl ether, see Menschutkin — Z. anorg. Ch. 49, 35, '06. For magnesium bromide hexa formic acid and magnesium bromide hexa acetic acid compounds in anhydrous solutions of the corresponding acids, see Isvietja d. Petersburger, Polytechn. Inst. 8, 293, '06; Chem. Centr. 77, II, 1482, '06.

# MAGNESIUM CARBONATE 178

## MAGNESIUM CARBONATE $\text{MgCO}_3$ .

### SOLUBILITY IN WATER IN PRESENCE OF CARBON DIOXIDE AT $15^\circ$ .

(Treadwell and Reuter — Z. anorg. Ch. 17, 200, '98.)

cc $\text{CO}_2$ per 100 cc. Gas Phase (at $0^\circ$ and 760 mm.).	Partial Pressure of $\text{CO}_2$ in mm. Hg.	Grams per 100 cc. Solution.			
		Free $\text{CO}_2$ .	$\text{MgCO}_3$ .	$\text{Mg}(\text{HCO}_3)_2$ .	Total Mg.
18.86	143.3	0.1190	...	1.2105	0.2016
5.47	41.6	0.0866	...	1.2105	0.2016
4.47	33.8	0.0035	...	1.2105	0.2016
1.54	11.7	...	0.0773	1.0766	0.2016
1.35	10.3	...	0.0765	0.7629	0.1492
1.07	8.2	...	0.0807	0.5952	0.1224
0.62	4.7	...	0.0701	0.3663	0.0865
0.60	4.6	...	0.0758	0.3417	0.0788
0.33	2.5	...	0.0748	0.2632	0.0655
0.21	1.6	...	0.0771	0.2229	0.0594
0.14	1.1	...	0.0710	0.2169	0.0566
0.03	0.3	...	0.0711	0.2036	0.0545
...	...	...	0.0685	0.2033	0.0536
...	...	...	0.0702	0.1960	0.0529
...	...	...	0.0625	0.2036	0.0520
...	...	...	0.0616	0.1954	0.0511
...	...	...	0.0641	0.1954	0.0518

Therefore at 0 partial pressure of  $\text{CO}_2$  and at  $15^\circ$  and mean barometric pressure, one liter of saturated aqueous solution contains 0.641 gram of  $\text{MgCO}_3$ , plus 1.954 grams  $\text{Mg}(\text{HCO}_3)_2$ .

### SOLUBILITY OF MAGNESIUM CARBONATE IN WATER CHARGED WITH CARBON DIOXIDE AT PRESSURES GREATER THAN ONE ATMOSPHERE.

(Engel and Ville — Compt. rend. 93, 340, '81; Engel — Ann. chim. phys. [6] 13, 349, '88.)

Pressure of $\text{CO}_2$ in Atmospheres.	G. $\text{MgCO}_3^*$ per Liter.		Pressure of $\text{CO}_2$ in Atmospheres.	G. $\text{MgCO}_3^*$ per Liter.	
	At $12^\circ$ .	At $19^\circ$ .		At $12^\circ$ .	At $19^\circ$ .
0.5	20.5	...	4.0	42.8	...
1.0	26.5	25.8	4.7	...	43.5
2.0	34.2	33.1 (2.1 At.)	6.0	50.6	48.5 (6.2 At.)
3.0	39.0	37.2 (3.2 At.)	9.0	...	56.6

### SOLUBILITY IN WATER SATURATED WITH $\text{CO}_2$ AT ONE ATMOSPHERE.

(Engel.)

t $^\circ$ .	Gms. $\text{MgCO}_3^*$ per Liter.	t $^\circ$ .	Gms. $\text{MgCO}_3^*$ per Liter.	t $^\circ$ .	Gms. $\text{MgCO}_3^*$ per Liter.
5	36	30	21	60	11
10	31	40	17	80	5
20	26			100	0

\* Dissolved as  $\text{Mg}(\text{HCO}_3)_2$ .

# 179 MAGNESIUM CARBONATE

SOLUBILITY OF MAGNESIUM CARBONATE IN AQUEOUS SOLUTIONS OF SODIUM CARBONATE AT 25°. The solutions being in equilibrium with an atmosphere free from CO<sub>2</sub>.

(Cameron and Seidell — J. Physic. Ch. 7, 588, '03.)

Wt. of 1 Liter of Solution.	Grams per Liter.		Reacting Weights per Liter.	
	Na <sub>2</sub> CO <sub>3</sub> .	MgCO <sub>3</sub> .	Na <sub>2</sub> CO <sub>3</sub> .	MgCO <sub>3</sub> .
996.8	0.00	0.223	0.000	0.00266
1019.9	23.12	0.288	0.220	0.00344
1047.7	50.75	0.510	0.482	0.00620
1082.5	86.42	0.879	0.820	0.01027
1118.9	127.3	1.314	1.209	0.01570
1147.7	160.8	1.636	1.526	0.01955
1166.1	181.9	1.972	1.727	0.02357
1189.4	213.2	2.317	2.024	0.02770

SOLUBILITY OF MAGNESIUM BI CARBONATE AND OF MAGNESIUM CARBONATE IN AQUEOUS SOLUTIONS OF SODIUM CHLORIDE AT 23°. The solutions being in equilibrium with an atmosphere of CO<sub>2</sub> in the one case, and in equilibrium with air free from CO<sub>2</sub> in the other.

(C. and S.)

In Presence of CO <sub>2</sub> as Gas Phase.		Wt. of 1 Liter.	In Presence of Air Free from CO <sub>2</sub> .	
Gms. NaCl per Liter.	Gms. Mg(HCO <sub>3</sub> ) <sub>2</sub> per Liter.		Gms. NaCl per Liter.	Gms. MgCO <sub>3</sub> per Liter.
7.0	30.64	996.9	0.0	0.176
56.5	30.18	1016.8	28.0	0.418
119.7	27.88	1041.1	59.5	0.527
163.9	24.96	1070.5	106.3	0.585
224.8	20.78	1094.5	147.4	0.544
306.6	10.75	1142.5	231.1	0.460
		1170.1	272.9	0.393
		1199.3	331.4	0.293

SOLUBILITY OF MAGNESIUM CARBONATE IN AQUEOUS SOLUTIONS OF SODIUM SULPHATE AT 24° AND AT 35.5°. The solutions being in equilibrium with an atmosphere free from CO<sub>2</sub>.

(Cameron and Seidell.)

## Results at 24°.

Wt. of 1 Liter.	Gms. Na <sub>2</sub> SO <sub>4</sub> per Liter.	Gms. MgCO <sub>3</sub> per Liter.
997.5	0.00	0.216
1021.2	25.12	0.586
1047.6	54.76	0.828
1080.9	95.68	1.020
1133.8	160.8	1.230
1157.3	191.9	1.280
1206.0	254.6	1.338
1242.0	305.1	1.388

## Results at 35.5°.

Wt. of 1 Liter.	Gms. Na <sub>2</sub> SO <sub>4</sub> per Liter.	Gms. MgCO <sub>3</sub> per Liter.
995.1	0.32	0.131
1032.9	41.84	0.577
1067.2	81.84	0.753
1094.8	116.56	0.904
1120.4	148.56	0.962
1151.7	186.7	1.047
1179.8	224.0	1.088
1236.5	299.2	1.130

# MAGNESIUM CHLORATE 180

## MAGNESIUM CHLORATE $\text{Mg}(\text{ClO}_3)_2$ .

### SOLUBILITY IN WATER.

(Meusser — Ber. 35, 1416, '02.)

t°.	Gms. $\text{Mg}(\text{ClO}_3)_2$ per 100 Gms. Solution.	Mols. $\text{Mg}(\text{ClO}_3)_2$ per 100 Mols. $\text{H}_2\text{O}$ .	Solid Phase.	t°.	Gms. $\text{Mg}(\text{ClO}_3)_2$ per 100 Gms. Solution.	Mols. $\text{Mg}(\text{ClO}_3)_2$ per 100 Mols. $\text{H}_2\text{O}$ .	Solid. Phase.
-18	51.64	10.05	$\text{Mg}(\text{ClO}_3)_2 \cdot 6\text{H}_2\text{O}$	42	63.82	16.16	$\text{Mg}(\text{ClO}_3)_2 \cdot 4\text{H}_2\text{O}$
0	53.27	10.73	"	65.5	69.12	20.08	"
18	56.50	12.22	"	39.5	65.37	17.76	$\text{Mg}(\text{ClO}_3)_2 \cdot 3\text{H}_2\text{O}$
29	60.23	14.25	"	61.0	69.46	21.40	"
35	63.65	16.48	"	68	70.69	22.69	"
				93	(73.71)	(26.38)	"

Sp. Gr. of saturated sol. at + 18° = 1.564.

## MAGNESIUM CHLORIDE $\text{MgCl}_2$ .

### SOLUBILITY IN WATER.

(van't Hoff and Meyerhoffer — Z. physik. Chem. 27, 75, '98; Engel; Lowenherz. Results quoted from Landolt and Börnstein — Tabellen, 3d. ed. p. 549, '06.)

t°.	Gms. $\text{MgCl}_2$ per 100 Gms Solution.	Gms Water.	Solid Phase.	t°.	Gms. $\text{MgCl}_2$ per 100 Gms Solution.	Gms Water.	Solid Phase.
-10	11.1	12.5	Ice	0	34.5	52.8	$\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$
-20	16.0	19.0	"	10	34.9	53.5	"
-30	19.4	24.0	"	20	35.3	54.5	"
-33.6	20.6	26.0	Ice + $\text{MgCl}_2 \cdot 12\text{H}_2\text{O}$	22	35.6	55.2	"
-12	26.7	36.5	$\text{MgCl}_2 \cdot 12\text{H}_2\text{O}$	25	36.2	56.7	"
-16.4	30.6	44.04 f. pt.	"	40	36.5	57.5	"
-16.8	31.6	46.2	$\text{MgCl}_2 \cdot 12\text{H}_2\text{O} +$ $\text{MgCl}_2 \cdot 8\text{H}_2\text{O} \alpha$	60	37.9	61.0	"
-17.4	32.3	47.6	$\text{MgCl}_2 \cdot 12\text{H}_2\text{O} +$ $\text{MgCl}_2 \cdot 8\text{H}_2\text{O} \beta$	80	39.8	66.0	"
-19.4	33.3	49.9	$\text{MgCl}_2 \cdot 12\text{H}_2\text{O} +$ $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$	100	42.2	73.0	"
-9.6	33.9	51.3	$\text{MgCl}_2 \cdot 8\text{H}_2\text{O} \beta$ + $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$	116.7	46.2	85.5	$\text{MgCl}_2 \cdot 6\text{H}_2\text{O} +$ $\text{MgCl}_2 \cdot 4\text{H}_2\text{O}$
-3.4	34.4	52.3	$\text{MgCl}_2 \cdot 8\text{H}_2\text{O} \alpha +$ $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$	152.6	49.1	96.4	$\text{MgCl}_2 \cdot 4\text{H}_2\text{O}$
			about	181.5	55.8	126.0	$\text{MgCl}_2 \cdot 4\text{H}_2\text{O} +$ $\text{MgCl}_2 \cdot 2\text{H}_2\text{O}$
				186	56.1	128.0	$\text{MgCl}_2 \cdot 2\text{H}_2\text{O}$

### SOLUBILITY OF MAGNESIUM CHLORIDE IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID AT 0°.

(Engel — Compt. rend. 104, 433, '87.)

Milligram	Mols. per 10 cc. Solution.	Sp. Gr. of Solutions.	Grams per Liter of Solution.
HCl.	$\frac{1}{2}\text{MgCl}_2$ .		HCl. $\text{MgCl}_2$ .
0.0	99.55	1.362	0.0 474.2
4.095	95.5	1.354	14.93 454.8
9.5	90.0	1.344	34.63 428.6
17.0	82.5	1.300	61.97 393.0
20.5	79.0	1.297	74.74 376.2
28.5	71.0	1.281	103.9 338.3
42.0	60.125	...	153.1 286.4
58.75	46.25	...	214.2 220.3
76.0	32.0	...	277.1 152.0
			sat. HCl (Ditte) 6.5

# 181 MAGNESIUM CHLORIDE

## SOLUBILITY OF MIXTURES OF MAGNESIUM CHLORIDE AND OTHER SALTS IN WATER AT 25°.

(Löwenherz — Z. physik. Chem. 13, 479, '94.)

Mixture.	Gram Mols. per 1000 Mols. H <sub>2</sub> O.	Gms. per Liter of Solution.
MgCl <sub>2</sub> .6H <sub>2</sub> O + MgSO <sub>4</sub> .6H <sub>2</sub> O	104 MgCl <sub>2</sub> + 14 MgSO <sub>4</sub>	25.0 Cl + 4.4 SO <sub>4</sub>
MgCl <sub>2</sub> .7H <sub>2</sub> O + MgSO <sub>4</sub> .6H <sub>2</sub> O	73 " + 15 "	19.5 " + 5.3 "
MgCl <sub>2</sub> .6H <sub>2</sub> O + MgCl <sub>2</sub> .KCl.6H <sub>2</sub> O	106 Cl + 1 K <sub>2</sub> + 105 Mg	26.9 Cl + 0.3 K + 45.7 SO <sub>4</sub>

Results for the remaining possible combinations of magnesium sulphate and potassium chloride are also given.

## MAGNESIUM CHROMATE MgCrO<sub>4</sub>.7H<sub>2</sub>O.

100 grams H<sub>2</sub>O dissolve 72.3 grams MgCrO<sub>4</sub> at 18°, or 100 grams solution contain 42.0 grams. Sp. Gr. = 1.422.

(Mylius and Funk — Ber. 30, 1718, '97.)

## MAGNESIUM POTASSIUM CHROMATE MgCrO<sub>4</sub>.K<sub>2</sub>CrO<sub>4</sub>.2H<sub>2</sub>O.

100 grams H<sub>2</sub>O dissolve 28.2 grams at 20°, and 34.3 grams at 60°.

(Schweitzer.)

## MAGNESIUM PLATINIC CYANIDE MgPt(CN)<sub>4</sub>.

### SOLUBILITY IN WATER.

(Buxhoeveden and Tamman — Z. anorg. Ch. 15, 319, '97.)

t°.	Gms. MgPt(CN) <sub>4</sub> per 100 Gms. Solution.	Solid Phase.	t°.	Gms. MgPt(CN) <sub>4</sub> per 100 Gms. Solution.	Solid Phase.
— 4.12	24.90	MgPt(CN) <sub>4</sub> .6.8–8.1H <sub>2</sub> O	48.7	40.89	MgPt(CN) <sub>4</sub> .4H <sub>2</sub> O
0.5	26.9	" (Red)	55	41.33	"
5.5	28.65	"	58.1	42.15	"
18.0	32.46	"	69.0	43.49	"
36.6	39.53	"	77.8	44.90	"
45.0	41.33	"	87.4	45.52	"
46.2	42.0	"	90.0	45.65	"
42.2	40.21	MgPt(CN) <sub>4</sub> .4H <sub>2</sub> O	93.0	45.04	"
46.3	39.85	" (Bright Green)	96.4	44.33	MgPt(CN) <sub>4</sub> .2H <sub>2</sub> O
			100.0	44.0	" (White)

## MAGNESIUM FLUORIDE MgF<sub>2</sub>.

One liter of water dissolves 0.076 gram MgF<sub>2</sub> at 18° by conductivity method.

(Kohlrausch — Z. physik. Ch. 50, 356, '04–'05.)

## MAGNESIUM HYDROXIDE Mg(OH)<sub>2</sub>.

One liter of water dissolves 0.008 – 0.009 gm. Mg(OH)<sub>2</sub> at 18° by conductivity method.

(Dupre and Brutus — Z. angew. Ch. 16, 55, '03.)

## SOLUBILITY OF MAGNESIUM OXIDE IN AQUEOUS SOLUTIONS CONTAINING SODIUM CHLORIDE AND SODIUM HYDROXIDE.

(Maigret — Bull. soc. chim. 33, 631, '05.)

Gms. NaCl per Liter.	Grams MgO per Liter Solution with Added:	
	0.8 g. NaOH per Liter.	4.0 g. NaOH per Liter.
125	0.07	0.03
140	0.045	...
160	none	none



## MAGNESIUM HYDROXIDE 182

### SOLUBILITY OF MAGNESIUM HYDROXIDE IN AQUEOUS SOLUTIONS OF AMMONIUM CHLORIDE AND OF AMMONIUM NITRATE AT 29°.

(Herz and Muhs — Z. anorg. Ch. 38, 140, '04.)

NOTE. — Pure  $\text{Mg}(\text{OH})_2$  was prepared and an excess shaken with solutions of ammonium chloride and of ammonium nitrate of different concentrations.

Concentration of $\text{NH}_4\text{Cl}$ or of $\text{NH}_4\text{NO}_3$ . (Normal.)	Acid Required for Liberated $\text{NH}_4\text{OH}$ in 25 cc. (Normal.)	Normality of:		Grams per Liter.	
		$\text{Mg}(\text{OH})_2$	$\text{NH}_4\text{Cl}$	$\text{Mg}(\text{OH})_2$	$\text{NH}_4\text{Cl}$
.7 ( $\text{NH}_4\text{Cl}$ )	0.09835	0.156	0.388	4.55	20.86
0.466 "	0.1108	0.108	0.250	3.15	13.39
0.35 "	0.09835	0.089	0.172	2.60	9.21
0.233 "	0.1108	0.0638	0.106	1.86	5.67
0.175 "	0.1108	0.049	0.0771	1.43	4.13
0.35 ( $\text{NH}_4\text{NO}_3$ )	0.1108	0.0833	0.1834 ( $\text{NH}_4\text{NO}_3$ )	2.43	14.69 ( $\text{NH}_4\text{NO}_3$ )
0.175 "	0.1108	0.0495	0.076	1.45	6.09 "

## MAGNESIUM IODATE $\text{Mg}(\text{IO}_3)_2$ .

### SOLUBILITY IN WATER.

(Mylius and Funk — Ber. 30, 1722, '97; Wiss. Abh. p. t. Reichanstalt 3, 446, '00.)

t°.	Gms. $\text{Mg}(\text{IO}_3)_2$ per 100 Gms. Solution.	Mols. $\text{Mg}(\text{IO}_3)_2$ per 100 Mols. $\text{H}_2\text{O}$ .	Solid Phase.	t°.	Gms. $\text{Mg}(\text{IO}_3)_2$ per 100 Gms. Solution.	Mols. $\text{Mg}(\text{IO}_3)_2$ per 100 Mols. $\text{H}_2\text{O}$ .	Solid Phase.
0	3.1	0.15	$\text{Mg}(\text{IO}_3)_2 \cdot 10\text{H}_2\text{O}$	0	6.8	0.34	$\text{Mg}(\text{IO}_3)_2 \cdot 4\text{H}_2\text{O}$
20	10.2	0.55	"	10	6.4	0.30	"
30	17.4	1.01	"	18	7.6	0.40	"
35	21.9	1.35	"	20	7.7	0.40	"
50	67.5	10.0	"	35	8.9	0.47	"
				63	12.6	0.69	"
				100	19.3	1.13	"

Sp. Gr. of solution sat. at 18° = 1.078.

## MAGNESIUM IODIDE $\text{MgI}_2$ .

### SOLUBILITY IN WATER.

(Menschutkin — Chem. Centr. 77, 1, 646, '06; at 18°, Mylius and Funk — Ber. 30, 1718, '97.)

t°.	Gms. $\text{MgI}_2$ per 100 Grams Solution.	Solid Phase.	t°.	Grams $\text{MgI}_2$ per 100 Grams Solution.	Solid Phase.
0	50.0	$\text{MgI}_2 \cdot 8\text{H}_2\text{O}$	50	61.6	$\text{MgI}_2 \cdot 6\text{H}_2\text{O}$
10	51.65	"	70	61.85	"
18	53.0 (59.7 M. and F.)	"	90	62.1	"
20	53.4	"	110	62.25	"
25	54.4	"	140	62.5	"
30	55.4	"	160	63.0	"
40	57.8	"	200	64.1	"
45	59.9	"			

Density of saturated solution at 18° = 1.909. (M. and F.)

**SOLUBILITY OF MAGNESIUM IODIDE ALCOHOL COMPOUNDS IN THE  
CORRESPONDING ALCOHOLS.**

(Menschutkin — Chem. Centr. 77, I, 335, '06.)

Results expressed in molecular per cent.

t°.	MgI <sub>2</sub> .6CH <sub>3</sub> OH in CH <sub>3</sub> OH.	MgI <sub>2</sub> .6C <sub>2</sub> H <sub>5</sub> OH in C <sub>2</sub> H <sub>5</sub> OH.	t°.	MgI <sub>2</sub> .6CH <sub>3</sub> OH in CH <sub>3</sub> OH.	MgI <sub>2</sub> .6C <sub>2</sub> H <sub>5</sub> OH in C <sub>2</sub> H <sub>5</sub> OH.
0	6.3	2.3	100	10.5	19.7
10	6.6	3.1	120	11.8	28.2
20	7.0	4.0	140	13.4	53.6
40	7.8	6.2	160	15.7	80.3 (145°)
60	8.6	9.3	180	18.7	100.0 (146.5°)
80	9.5	13.5	200	23.1	...

**SOLUBILITY OF MAGNESIUM IODIDE DI ETHERATE (MgI<sub>2</sub>.2C<sub>4</sub>H<sub>10</sub>O) IN  
ETHYL ETHER.**

(Menschutkin — Z. anorg. Ch. 49, 46, '06.)

Synthetic Method used, see  
page 9.

Results in the Critical  
Vicinity.

t°.	Grams per 100 Gms. Solution.		t°.	Gms. per 100 Gms. Solution.	
	MgI <sub>2</sub> .	MgI <sub>2</sub> .2C <sub>4</sub> H <sub>10</sub> O.		MgI <sub>2</sub> .	MgI <sub>2</sub> .2C <sub>4</sub> H <sub>10</sub> O.
5.4	1.45	2.2	37.3	19.4	29.3
11.8	2.43	3.7	38.5	22.45	34.4
15.6	3.46	5.3	38.5	26.07	39.9
18.1	5.4	8.3	38.5	29.8	45.7
20.4	7.55	11.6	38	32.8	50.3
22.2	11.28	17.3			

Two liquid phases appear near the melting point of the magnesium iodide di etherate. The lower may be considered as a solution of ether in di etherate, and the upper as a solution of the lower layer in ether. The critical temperature is 38.5°.

Lower Layer.			Upper Layer.		
t°.	Gms. per 100 Gms. Solution.		t°.	Gms. per 100 Gms. Solution.	
	MgI <sub>2</sub> .	MgI <sub>2</sub> .2C <sub>4</sub> H <sub>10</sub> O.		MgI <sub>2</sub> .	MgI <sub>2</sub> .2C <sub>4</sub> H <sub>10</sub> O.
14.8	35.5	54.4	18.6	13.57	20.8
20.0	35.8	54.8	23.2	14.4	22.1
28.4	35.5	54.4	24.4	14.6	22.4
33	35.7	54.7	32.4	15.82	24.2
35	35.3	54.1			

The solubility of double compounds of magnesium iodide and alkyl esters in the corresponding acetates is given by Menschutkin — Chem. Centr. 77, I, 647, '06. For the solubility of magnesium iodide hexa acetic acid compound in anhydrous acetic acid solutions, see Chem. Centr. 77, II, 1482, '06.

**MAGNESIUM NITRATE** 184**MAGNESIUM NITRATE**  $\text{Mg}(\text{NO}_3)_2$ .

## SOLUBILITY IN WATER.

(Funk — Wiss. Abh. p. t. Reichanstalt 3, 437, '00.)

t°.	Gms. $\text{Mg}(\text{NO}_3)_2$ per 100 Gms. Solution.	Mols. $\text{Mg}(\text{NO}_3)_2$ per 100 Mols. $\text{H}_2\text{O}$ .	Solid Phase.	t°.	Gms. $\text{Mg}(\text{NO}_3)_2$ per 100 Gms. Solution.	Mols. $\text{Mg}(\text{NO}_3)_2$ per 100 Mols. $\text{H}_2\text{O}$ .	Solid Phase.
-23	35.44	6.6	$\text{Mg}(\text{NO}_3)_2 \cdot 9\text{H}_2\text{O}$	40	45.87	10.3	$\text{Mg}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$
-20	36.19	7.0	"	80	53.69	14.6	"
-18	38.03	7.4	"	90	57.81	16.7	"
-18	38.03	7.37	$\text{Mg}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$	89	63.14	20.9	}
-4.5	39.50	7.92	"	77.5	65.67	23.2	
0	39.96	8.08	"	67	67.55	25.1	
+18	42.33	8.9	"				

\* Reverse curve.

Sp. Gr. of solution saturated at 18° = 1.384.

**MAGNESIUM OXALATE**  $\text{Mg} \cdot \text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$ .One liter of water dissolves 0.3 gram  $\text{MgC}_2\text{O}_4$  at 18° (conductivity method).

(Kohlrausch — Z. physik. Ch. 50, 356, '05.)

**MAGNESIUM (Hypo) PHOSPHATE**  $\text{Mg}_3\text{P}_2\text{O}_8 \cdot 12\text{H}_2\text{O}$ .

One liter of water dissolves 0.066 gram hypophosphate.

(Salzer — Liebigs Ann. 232, 114, '86.)

One liter of water dissolves 5.0 grams magnesium hydrogen hypophosphate  $\text{MgH}_2\text{P}_2\text{O}_8 \cdot 4\text{H}_2\text{O}$ .

(Salzer.)

**MAGNESIUM SALICYLATE**  $\text{Mg}(\text{C}_7\text{H}_5\text{O}_3)_2 \cdot 4\text{H}_2\text{O}$ .

One liter of saturated solution contains 8.015 grams of the salt.

(Barthe — Bull. soc. chim. [3] 11, 519, '94.)

**MAGNESIUM FLUOSILICATE**  $\text{MgSiF}_6 \cdot 6\text{H}_2\text{O}$ .

One liter of water dissolves 652 grams of the salt at 17.5°. Sp. Gr. of solution = 1.235.

(Stolba — Chem. Centr. 578, '77.)

**MAGNESIUM SULPHATE**  $\text{MgSO}_4$ .

## SOLUBILITY IN WATER.

(Mulder; Tilden — J. Ch. Soc. 45, 409, '84; Etard — Compt. rend. 106, 741, '88.)

Etard's results for the lower temperatures are somewhat low. Mulder's and Tilden's results agree very well.

t°.	Gms. $\text{MgSO}_4$ Solution.	per 100 Gms. Water.	Solid Phase.	t°.	Gms. $\text{MgSO}_4$ Solution.	per 100 Gms. Water.	Solid Phase.
0	21.2	26.9	$\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$	50	33.5	50.3	$\text{MgSO}_4 \cdot 6\text{H}_2\text{O}$
10	24.0	31.5	"	60	35.5	55.0	"
20	26.5	36.2	"	70	37.5	59.6	"
25	28.2	38.5	"	80	39.1	64.2	"
30	29.0	40.9	"	90	40.7	68.9	"
40	31.2	45.6	"	100	42.5	73.8	"
				110	45.5	83.6	"

For temperatures between 123° and 190°, grams  $\text{MgSO}_4$  per 100 grams solution = 48.5 - 0.4403 t. (Etard).For densities of aqueous solutions of  $\text{MgSO}_4$ , see Barnes and Scott — J. Physic. Ch. 2, 542, '98.

## 185      MAGNESIUM SULPHATE

### SOLUBILITY OF MAGNESIUM SULPHATE IN METHYL AND ETHYL ALCOHOLS.

(de Bruyn — Rec. trav. chim. 11, 112, '92.)

Solvent.	t°.	Per 100 Gms. Solvent.	Solvent.	t°.	Per 100 Gms. Solvent.
Abs. CH <sub>3</sub> OH	18	1.18 gms. MgSO <sub>4</sub>	93% Methyl Alc.	17	9.7 gms. MgSO <sub>4</sub> ·7H <sub>2</sub> O
"	17	41.0 " MgSO <sub>4</sub> ·7H <sub>2</sub> O	50% " "	3-4	4.1 " "
"	3-4	29.0 " "	Abs. C <sub>2</sub> H <sub>5</sub> OH	3	1.3 " "

### SOLUBILITY IN AQUEOUS ETHYL ALCOHOL.

(Schiff — Liebig's Ann. 118, 365, '61.)

Wt. per cent Alcohol	10	20	40
G. MgSO <sub>4</sub> ·7H <sub>2</sub> O per 100 gms. solvent	64.7	27.1	1.65

### SOLUBILITY OF MAGNESIUM SULPHATE IN SATURATED SUGAR SOLUTION AT 31.25°.

(Köhler — Z. Ver. Zuckerind. 47, 447, '97.)

100 grams saturated aqueous solution contain 46.52 grams sugar + 14.0 grams MgSO<sub>4</sub>.  
100 grams water dissolve 119.6 grams sugar + 36.0 grams MgSO<sub>4</sub>.

### MAGNESIUM POTASSIUM SULPHATE MgK<sub>2</sub>(SO<sub>4</sub>)<sub>2</sub>·6H<sub>2</sub>O.

#### SOLUBILITY IN WATER.

(Tobler — Liebig's Ann. 95, 193, '55.)

	t° = 0°	20°	30°	45°	60°	75°
Gms. MgK <sub>2</sub> (SO <sub>4</sub> ) <sub>2</sub> per 100 gms. H <sub>2</sub> O	14.1	25.0	30.4	40.5	50.2	59.8

### MAGNESIUM SULPHITE MgSO<sub>3</sub>·6H<sub>2</sub>O.

100 grams cold water dissolve 1.25 grams sulphite; 100 grams boiling water dissolve 0.83 gram.

(Hager — Chem. Centrbl. 135, '75.)

### MALONIC ACID CH<sub>2</sub>(COOH)<sub>2</sub>.

#### SOLUBILITY IN WATER.

(Klobbie — Z. physik. Chem. 24, 622, '97; Miczynski — Monatsb. Ch. 7, 259, '86; Henry — Compt. rend 99, 1157, '84; Lamouroux — *Ibid.* 128, '998, '99.)

t°.	Grams CH <sub>2</sub> (COOH) <sub>2</sub> per 100		t°.	Grams CH <sub>2</sub> (COOH) <sub>2</sub> per 100	
	Gms. Solution.*	cc. Solution (L.).		Gms. Solution.*	cc. Solution (L.).
0	52.0	61.0	50	71.0	93.0
10	56.5	67.0	60	74.5	100.0
20	60.5	73.0	70	...	106.0
25	62.2	76.3	80	82.0	...
30	64.0	80.0	100	89.0	...
40	68.0	86.5	132 (m. pt.)	100.0	...

\* Average curve from results of K., M., and H.

# MALONIC ACID

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## SOLUBILITY OF MALONIC ACID IN ETHER. (Klobbie.)

t°.	Gms. CH <sub>3</sub> (COOH) <sub>2</sub> per 100 Gms. Solution.	t°.	Gms. CH <sub>3</sub> (COOH) <sub>2</sub> per 100 Gms. Solution.	t°.	Gms. CH <sub>3</sub> (COOH) <sub>2</sub> per 100 Gms. Solution.
0	6.25	30	10.5	100	46.0
10	7.74	80	33.0	110	56.0
20	9.00	90	39.0	120	70.0
25	9.7			132 (m. pt.)	100.0

100 grams saturated solution of malonic acid in pyridine contain 14.6 grams at 26°.

(Holtz — J. Physic. Ch. 9, 764, '05.)

## SOLUBILITY OF SUBSTITUTED MALONIC ACIDS IN WATER. (Lamoureux.)

t°.	Grams per 100 cc. Saturated Aqueous Solution.					
	Malonic Acid.	Methyl Malonic Acid.	Ethyl Malonic Acid.	n Propyl Malonic Acid.	n Butyl Malonic Acid.	Iso Amyl Malonic Acid.
0	61.1	44.3	52.8	45.6	11.6	38.5
15	70.2	58.5	63.6	60.1	30.4	51.8
25	76.3	67.9	71.2	70.0	43.8	79.3
30	92.6	91.5	90.8	94.4	79.3	83.4

# MANGANESE BORATE MnH<sub>4</sub>(BO<sub>3</sub>)<sub>2</sub>H<sub>2</sub>O.

## SOLUBILITY IN WATER AND IN AQUEOUS SALT SOLUTIONS. (Hartley and Ramage — J. Ch. Soc. 63, 137, '93.)

t°.	Grams MnH <sub>4</sub> (BO <sub>3</sub> ) <sub>2</sub> per Liter in Solutions of:				
	H <sub>2</sub> O + trace Na <sub>2</sub> SO <sub>4</sub> .	Na <sub>2</sub> SO <sub>4</sub> (0.2 Gms. per Liter).	Na <sub>2</sub> SO <sub>4</sub> (20 Gms. per Liter).	NaCl (20 Gms. per Liter).	CaCl <sub>2</sub> (20 Gms. per Liter).
14	0.94	1.7	...	...	...
18	...	...	0.77	1.31	2.91
40	0.50	0.69 (52°)	0.65	...	2.44
60	...	...	0.36	0.60	2.25
80	0.08	...	0.12	0.29	1.35

# MANGANESE BROMIDE MnBr<sub>2</sub>·4H<sub>2</sub>O.

## SOLUBILITY IN WATER. (Etard — Ann. chim. phys. [7] 2, 537, '94.)

t°.	Gms. MnBr <sub>2</sub> per 100 Gms. Solution.	Solid Phase.	t°.	Gms. MnBr <sub>2</sub> per 100 Gms. Solution.	Solid Phase.
-20	52.3	MnBr <sub>2</sub> ·4H <sub>2</sub> O	40	62.8	MnBr <sub>2</sub> ·4H <sub>2</sub> O
-10	54.2	"	50	64.5	"
0	56.0	"	60	66.3	"
10	57.6	"	70	68.0	"
20	59.5	"	80	69.2	MnBr <sub>2</sub> ·2H <sub>2</sub> O
25	60.2	"	90	69.3	"
30	61.1	"	100	69.5	"

**MANGANESE CHLORIDE**  $\text{MnCl}_2 \cdot 4\text{H}_2\text{O}$ .

## SOLUBILITY IN WATER.

(Etard; Dawson and Williams — Z. physik. Chem. 31, 63, '99.)

t°.	Sp. Gr. of Solutions.	Grams $\text{MnCl}_2$ per 100 Grams		Mols. $\text{MnCl}_2$ per 100 Mols. $\text{H}_2\text{O}$ .	Solid Phase.
		Water.	Solution.		
-20	...	53.8	35.0	...	$\text{MnCl}_2 \cdot 4\text{H}_2\text{O}$
-10	...	58.7	37.0	...	"
0	...	63.4	38.8	...	"
+10	...	68.1	40.5	...	"
20	...	73.9	42.5	...	"
25	1.4991	77.18	43.55	11.08	"
30	1.5049	80.71	44.68	11.55	"
40	1.5348	88.59	46.96	12.69	"
50	1.5744	98.15	49.53	14.05	"
57.65	1.6097	105.4	51.33	15.10	"
60	1.6108	108.6	52.06	15.55	$\text{MnCl}_2 \cdot 2\text{H}_2\text{O}$
70	1.6134	110.6	52.52	15.85	"
80	...	112.7	52.98	16.14	"
90	...	114.1	53.2	...	"
100	...	115.3	53.5	...	"
120	...	118.8	54.3	...	"
140	...	119.5	55.0	...	"

One liter of water dissolves 87.0 grams  $\text{MnCl}_2$ . One liter of sat. HCl dissolves 19.0 grams  $\text{MnCl}_2$  at 12°.

(Ditte — Compt. rend. 92, 242, '81.)

**MANGANESE FLUO SILICATE**  $\text{MnSiF}_6 \cdot 6\text{H}_2\text{O}$ .

100 grams  $\text{H}_2\text{O}$  dissolve 140 grams salt at 17.5°. Sp. Gr. of solution = 1.448.

(Stolba — Chem. Centr. 292, '83.)

**MANGANESE NITRATE**  $\text{Mn}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$ .

## SOLUBILITY IN WATER.

(Funk — Wiss. Abh. p. t. Reichsanstalt 3, 438, '00.)

t°.	Gms.		Mols.	Solid	t°.	Gms.		Mols.	Solid
	$\text{Mn}(\text{NO}_3)_2$	per 100				$\text{Mn}(\text{NO}_3)_2$	per 100		
	Gms. Sol.	Mols. $\text{H}_2\text{O}$ .		Phase.		Gms. Sol.	Mols. $\text{H}_2\text{O}$ .		Phase.
-20	42.29	7.37	$\text{Mn}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$ .		18	57.33	13.5	$\text{Mn}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$ .	
-26	43.15	7.63			"	25	62.37		16.7
-21	44.30	8.0	"		27	65.66	19.2	$\text{Mn}(\text{NO}_3)_2 \cdot 3\text{H}_2\text{O}$ .	
-16	45.52	8.4			"	29	66.99		20.4
-5	48.88	9.61	"		30	67.38	20.7	"	
0	50.49	10.2			"	34	71.31		24.9
+11	54.50	12.0	"		35.5	76.82	33.3	"	

Sp. Gr. of solution saturated at 18° = 1.624.

**MANGANESE (Hypo) PHOSPHITE**  $\text{Mn}(\text{PH}_2\text{O}_2)_2 \cdot \text{H}_2\text{O}$ .

100 grams  $\text{H}_2\text{O}$  dissolve 15.15 grams salt at 25°, and 16.6 grams at b. pt.

# MANGANESE SULPHATE 188

## MANGANESE SULPHATE $\text{MnSO}_4 \cdot 5\text{H}_2\text{O}$ .

### SOLUBILITY IN WATER.

(Cottrell — J. Physic. Ch. 4, 651, '01; Richards and Fraprie — Am. Ch. J. 26, 77, '01. The results of Linebarger — Am. Ch. J. 15, 225, '93, were shown to be incorrect by Cottrell, and this conclusion was confirmed by R. and F.)

t°.	Grams $\text{MnSO}_4$ per 100 Gms.		Solid Phase.	t°.	Grams $\text{MnSO}_4$ per 100 Gms.		Solid Phase
	Water.	Solution.			Water.	Solution.	
-10	47.96	32.40	$\text{MnSO}_4 \cdot 7\text{H}_2\text{O}$	16	63.94	38.99	$\text{MnSO}_4 \cdot 4\text{H}_2\text{O}$
0	53.23	34.73	"	18.5	64.19	39.10	"
5	56.24	35.99	"	25	65.32	39.53	"
9	59.33	37.24	"	30	66.44	39.93	"
12	61.77	38.19	"	39.9	68.81	40.77	"
14.3	63.93	39.00	"	49.9	72.63	42.08	"
5	58.06	36.69	$\text{MnSO}_4 \cdot 5\text{H}_2\text{O}$	41.4	60.87	37.84	$\text{MnSO}_4 \cdot \text{H}_2\text{O}$
9	59.19	37.18	"	50	58.17	36.76	"
15	61.08	37.91	"	60	55.0	35.49	"
25	64.78	39.31	"	70	52.0	34.22	"
30	67.76	40.38	"	80	48.0	32.43	"
35.5	71.61	41.74	"	90	42.5	29.83	"
				100	32.0	24.24	"

### SOLUBILITY OF MANGANESE SULPHATE, COPPER SULPHATE MIXED CRYSTALS IN WATER AT 18°.

(Stortenbecker — Z. physik. Chem. 34, 112, '00.)

Mols. per 100 $\text{H}_2\text{O}$ .		Mol. per cent Cu in:		Mols. per 100 $\text{H}_2\text{O}$ .		Mol. per cent Cu in:	
Cu.	Mn.	Solution.	Crystals.	Cu.	Mn.	Solution.	Crystals.
Solid Phase, $\text{CuMnSO}_4 \cdot 5\text{H}_2\text{O}$ , Triclinic.				Solid Phase, $\text{CuMnSO}_4 \cdot 5\text{H}_2\text{O}$ , Triclinic.			
2.282	0	100	100	[0.73	6.37	10.27	10.5]
...	...	90.5	...	...	...	5.0	4.9
2.23	0.44	83.5	...	0.34	7.03	4.60	...
...	...	74.1	97.3	...	...	2.31	2.15
...	...	57.7	95.1	...	7.375	0.0	0.0
...	...	31.0	81.3	Solid Phase, $\text{CuMnSO}_4$ , Monoclinic. $7\text{H}_2\text{O}$ .			
1.54	3.76	29.0	...	...	...	20.4	28.2*
...	...	26.1	70.4	[1.06	5.58	15.9	23.5]
1.31	4.70	21.8	...	...	...	12.45	20.8
...	...	21.2	42.6	[0.73	6.37	10.27	16.0]
...	...	20.0	34.4	...	...	4.60	5.8*
[1.06	5.58	15.9	22.9]	...	±8	0.0	0.0
...	...	13.9	15.2*				

\* Indicates meta stabil points.

$\text{CuMnSO}_4 \cdot 5\text{H}_2\text{O} = 100-90.8$  and  $2.11-0$  mol. per cent Cu.

$\text{CuMnSO}_4 \cdot 7\text{H}_2\text{O} = 37.8-4.92$  mol. per cent Cu.

### SOLUBILITY OF MANGANESE SULPHATE IN GLYCOL.

100 grams saturated solution contain 0.5 gram  $\text{MnSO}_4$ .

(de Coninck — Bul. acad. roy. Belgique, 359, '65.)

189 **MANGANESE SULPHATE****SOLUBILITY OF MANGANESE SULPHATE IN AQUEOUS ETHYL AND  
PROPYL ALCOHOL SOLUTIONS AT 20°.**

(Linebarger — Am. Ch. J. 14, 380, '92; Snell — J. Physic. Ch. 2, 474, '98.)

Conc. of Alcohol in Wt. per cent.	Gms. $MnSO_4$ per 100 Gms. Aq.		Conc. of Alcohol in Wt. per cent.	Gms. $MnSO_4$ per 100 Gms. Aq.	
	Ethyl Alc.	Propyl Alc.		Ethyl Alc.	Propyl Alc.
34	9.5	6.0	44	3.3	1.9
36	7.2	4.6	48	2.2	1.4
38	5.8	3.5	52	1.4	1.1
40	4.7	2.8			

**MANGANESE POTASSIUM VANADATE  $MnKV_5O_{14} \cdot 8H_2O$ .**100 grams  $H_2O$  dissolve 1.7 grams salt at 18°.

(Radan — Liebig's Ann. 251, 129, '89.)

**MANNITE  $C_6H_8(OH)_6$ .****SOLUBILITY IN WATER.**

(Campetti — Abs. in Z. physik. Chem. 41, 109, '02.)

t°.	Grams $C_6H_8(OH)_6$ per 100 Grams.	
	Water.	Solution.
10	13.94	12.78
15	16.18	14.63
20	18.98	16.86

100 grams of saturated solution of mannite in Pyridine contain 0.47 gram  $C_6H_8(OH)_6$  at 26°.

(Holtz — J. Physic. Ch. 9, 764, '05.)

**MANNITOL  $C_6H_8(OH)_6$ .****SOLUBILITY IN WATER.**

(Findlay — J. Ch. Soc. 81, 1219, '02.)

t°.	Wt. of 1 cc. in Grams.	Gms. Mannitol per 100 Gms. $H_2O$ .	G. M. Mannitol per 100 G. M. $H_2O$ .	t°.	Wt. of 1 cc. in Grams.	Gms. Mannitol per 100 Gms. $H_2O$ .	G. M. Mannitol per 100 G. M. $H_2O$ .
0	1.044	7.59	0.75	50	1.099 (47.7°)	47.01	4.65
10	...	11.63	1.15	60	...	60.01	5.94
15	1.05	14.38	1.42	70	1.148 (68°)	74.50	7.35
20	...	17.71	1.75	80	...	91.5	9.04
25	...	21.39	2.11	90	1.207 (85.9°)	110.8	10.96
30	1.076 (31.1°)	25.40	2.51	100	...	133.1	13.17
40	...	35.40	3.50				

NOTE. — In the original paper the author writes, "grams of substance in 100 grams of solvent (percentage solubility)" and "moles of substance in 100 mols of solvent (percentage molar solubility)," thus implying equivalence of the terms and giving rise to uncertainty as to which is really intended.

**MERCURY BROMIDE (ic)  $HgBr_2$ . SOLUBILITY IN WATER.**

t°.	Gms. $HgBr_2$ per 100 Gms. $H_2O$ .	Authority.
9	1.06	(Lassaigne — J. chim. med. 12, 177, '76.)
25	0.61	(Sherrill — Z. physik. Ch. 43, 727, '03.)
100	20-25	(Lassaigne.)



# MERCURY BROMIDE

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## SOLUBILITY OF MERCURIC BROMIDE ORGANIC SOLVENTS.

### In Carbon Bisulphide.

(Arctowski — Z. anorg. Ch. 6, 267, '94.)

t°.	Gms. HgBr <sub>2</sub> per 100 Gms. Solution.	t°.	Gms. HgBr <sub>2</sub> per 100 Gms. Solution.
-10	0.049	15	0.140
-5	0.068	20	0.187
0	0.087	25	0.232
+5	0.105	30	0.274
10	0.122		

### In Other Solvents at 18°-20°.

(Sulc. — *Ibid.* 25, 401, '00.)

Solvent.	Formula.	Gms. HgBr <sub>2</sub> per 100 Gms. Solvent.
Chloroform	CHCl <sub>3</sub>	0.126
Bromoform	CHBr <sub>3</sub>	0.679
Tetra Chlor Methane	CCl <sub>4</sub>	0.003
Ethyl Bromide	C <sub>2</sub> H <sub>5</sub> Br	2.31
Ethylene Di Bromide	C <sub>2</sub> H <sub>4</sub> Br <sub>2</sub>	2.34

Mercurous bromide Hg<sub>2</sub>Br<sub>2</sub>. One liter of saturated aqueous solution contains 0.000039 gram Hg<sub>2</sub>Br<sub>2</sub> at 25°.

(Sherrill)

# MERCURY CHLORIDE (ic) HgCl<sub>2</sub>.

## SOLUBILITY IN WATER.

(Etard — Ann. chim. phys. [7] 2, 563, '04; at 25°, Foote and Levy — Am. Ch. J. 35, 238, '06; at room temp. Rohland — Z. anorg. Ch. 18, 328, '98; see also Poggiale — Ann. chim. phys. [3] 8, 468, '43.)

t°.	Gms. HgCl <sub>2</sub> per 100 Gms. Solution.	t°.	Gms. HgCl <sub>2</sub> per 100 Gms. Solution.	t°.	Gms. HgCl <sub>2</sub> per 100 Gms. Solution.
0	3.5	30	7.2	100	38.0
10	4.5	40	9.3	120	59.0
20	5.4 (6.88, R.)	60	14.0	140	77.0
25	6.9 (F. and L.)	80	23.1	150	78.5

## SOLUBILITY OF MERCURIC CHLORIDE IN AQUEOUS SOLUTIONS OF SODIUM CHLORIDE.

(Homeyer and Ritsert — Pharm. Ztg. 33, 738, '88.)

Per cent Concentration of NaCl Solutions.	Gms. HgCl <sub>2</sub> per 100 Gms. NaCl Solution at:		
	15°	65°	100°
0.5	10	13	44
1.0	14	18	48
5.0	30	36	64
10.0	58	68	110
25.0	120	142	196
26.0 (saturated)	128	152	208

## SOLUBILITY OF MERCURIC CHLORIDE IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID AT:

0°.

(Engel — Ann. chim. phys. [6] 17, 362, '89.)

20-25° (?).

(Ditte — *Ibid.* [5] 22, 551, '81.)

Mg.	Mols. per 100 cc. Sol.	Gms. per 100 cc. Sol.	Sp. Gr. of	Parts HCl	Parts HgCl <sub>2</sub>	
HCl.	$\frac{1}{2}$ HgCl.	HCl.	Solutions.	per 100 Parts H <sub>2</sub> O.	per 100 Parts Solution.	
4.3	9.7	1.57	13.11	1.117	0.0	6.8
9.9	19.8	3.61	18.04	1.238	5.6	46.8
17.8	35.5	6.49	32.44	1.427	10.1	73.7
26.9	55.6	9.81	49.04	1.665	13.8	87.8
32.25	68.9	11.76	58.80	1.811	21.1	127.4
34.25	72.4	12.48	62.40	1.874	31.0	141.9
41.5	85.5	15.13	75.65	2.023	50.0	148.0
48.1	88.6	17.54	87.70	2.066	68.0	154.0
70.9	95.7	25.84	129.20	2.198		

# SOLUBILITY OF MIXTURES OF SODIUM AND MERCURIC CHLORIDE IN WATER AT 25°.

(Foote and Levy — Am. Ch. J. 35, 230, '06.)

Gms. per 100 Gms. Solution.		Gms. per 100 Gms. Undissolved Residue.			Solid Phase.
NaCl.	HgCl <sub>2</sub> .	NaCl.	HgCl <sub>2</sub> .	H <sub>2</sub> O.	
26.5	none	100	none	none	NaCl
18.66	51.35	...	16.39	...	NaCl and NaCl.HgCl <sub>2</sub> .2H <sub>2</sub> O
18.71	51.32	...	21.98	...	
18.64	51.42	...	65.42	...	
18.87	51.26	...	71.25	...	
14.97	57.74	16.38	74.18	9.44	Double Salt NaCl.HgCl <sub>2</sub> .2H <sub>2</sub> O Calc. Comp. = 16.01% NaCl 74.14% HgCl <sub>2</sub> .85% H <sub>2</sub> O
14.03	59.69	16.36	74.21	9.43	
13.25	62.16	16.16	74.70	9.14	
13.17	62.59	15.96	74.76	9.28	
12.97	62.50	...	78.20	...	NaCl.HgCl <sub>2</sub> .2H <sub>2</sub> O and HgCl <sub>2</sub>
13.14	62.48	...	88.64	...	
13.15	62.55	...	90.83	...	
Two determinations made at 10.3° gave:					
19.46	46.49	67.46	29.19	3.35	
19.48	46.50	22.83	68.85	8.32	

# SOLUBILITY OF MIXTURES OF POTASSIUM AND MERCURIC CHLORIDES IN WATER AT 25°.

(Foote and Levy.)

Composition of Solution. Grams per 100 Grams Solution.		Percentage Composition of Undissolved Residue			Solid Phase.
KCl.	HgCl <sub>2</sub> .	KCl.	HgCl <sub>2</sub> .	H <sub>2</sub> O.	
26.46	none	100	none	...	KCl
26.24	15.04	...	3.63	...	KCl and 2KCl.HgCl <sub>2</sub> .H <sub>2</sub> O
26.43	15.02	...	26.15	...	
26.33	15.02	...	52.01	...	
26.33	14.92	...	61.04	...	
23.74	18.91	34.61	61.66	3.73	2KCl.HgCl <sub>2</sub> .H <sub>2</sub> O Calc. Composition 34.05% KCl, 61.84% HgCl <sub>2</sub> , 4.11% H <sub>2</sub> O
22.36	21.39	34.77	62.02	3.21	
21.39	23.88	34.05	61.84	3.35	
20.32	27.62	...	65.24	...	
20.26	27.38	...	73.98	...	2KCl.HgCl <sub>2</sub> .H <sub>2</sub> O and KCl.HgCl <sub>2</sub> .H <sub>2</sub> O
17.85	25.34	21.89	75.10	3.01	
9.26	18.95	21.02	73.36	5.62	
7.80	19.56	20.76	73.06	6.18	
6.84	22.81	20.75	74.54	4.71	KCl.HgCl <sub>2</sub> .H <sub>2</sub> O Calc. Composition 20.52% KCl, 74.53% HgCl <sub>2</sub> , 5.47% H <sub>2</sub> O
6.66	24.32	20.54	73.99	5.47	
6.52	25.13	...	76.46	...	
6.64	25.16	...	80.60	...	
6.27	25.11	12.09	83.20	4.71	KCl.2HgCl <sub>2</sub> .2H <sub>2</sub> O Calc. Composition 11.43% KCl, 83.05% HgCl <sub>2</sub> .5.52% H <sub>2</sub> O
5.77	24.73	11.87	83.18	4.95	
4.68	24.75	...	84.46	...	
4.66	25.17	...	93.68	...	
4.69	24.82	...	98.50	...	KCl.2HgCl <sub>2</sub> .2H <sub>2</sub> O and HgCl <sub>2</sub>
none	6.90	none	100.00	none	
					HgCl <sub>2</sub>

SOLUBILITY OF MIXTURES OF RUBIDIUM AND MERCURIC CHLORIDES  
IN WATER AT 25°.

(Foote and Levy.)

Composition of Solution. Grams per 100 Grams. Solution.		Percentage Composition of Undissolved Residue.			Solid Phase.
RbCl.	HgCl <sub>2</sub> .	RbCl.	HgCl <sub>2</sub> .	H <sub>2</sub> O.	
48.57	none	100.0	none	none	RbCl
46.76	9.18	88.04	11.24	0.72	RbCl and 2RbCl.HgCl <sub>2</sub> .H <sub>2</sub> O
47.54	9.49	60.33	37.51	2.16	
47.55	9.39	56.59	40.75	2.66	
47.3	9.47	46.73	49.38	3.88	
47.65	10.35	46.50	50.92	2.58	2RbCl.HgCl <sub>2</sub> .H <sub>2</sub> O Calc. Com- position 45.55% RbCl, 51.05% HgCl <sub>2</sub> , 3.4% H <sub>2</sub> O
35.16	19.58	45.98	50.80	3.22	
34.77	19.94	43.07	52.44	4.49	2RbCl.HgCl <sub>2</sub> .H <sub>2</sub> O and 3RbCl. 2HgCl <sub>2</sub> .3H <sub>2</sub> O
34.76	20.10	41.10	55.36	3.54	
30.27	20.17	39.07	57.34	3.59	3RbCl.2HgCl <sub>2</sub> .2H <sub>2</sub> O Calc. Composition 38.55% RbCl, 57.62% HgCl <sub>2</sub> , 3.83% H <sub>2</sub> O
29.20	20.55	39.10	57.47	3.43	
27.38	20.63	38.67	57.40	3.93	3RbCl.2HgCl <sub>2</sub> .2H <sub>2</sub> O and RbCl.HgCl <sub>2</sub> .H <sub>2</sub> O
26.83	20.87	38.48	57.36	4.16	
27.09	20.97	31.40	64.35	4.25	RbCl.HgCl <sub>2</sub> .H <sub>2</sub> O Calc. Composition 29.46% RbCl, 66.11% HgCl <sub>2</sub> , 4.40% H <sub>2</sub> O
26.15	20.58	30.34	65.48	4.18	
23.81	18.71	30.87	65.10	4.03	RbCl.HgCl <sub>2</sub> .H <sub>2</sub> O and 3RbCl 4HgCl <sub>2</sub> .H <sub>2</sub> O
18.10	14.25	29.87	65.28	4.85	
10.87	10.42	29.33	66.15	4.52	3RbCl.4HgCl <sub>2</sub> .H <sub>2</sub> O Calc. Composition 24.76% RbCl, 74.01% HgCl <sub>2</sub> , 1.23% H <sub>2</sub> O
10.68	10.56	28.59	67.99	3.42	
10.06	10.05	26.22	72.20	1.58	3RbCl.4HgCl <sub>2</sub> .H <sub>2</sub> O and RbCl 5HgCl <sub>2</sub>
10.06	9.86	25.28	73.38	0.84	
8.48	8.71	25.30	73.15	1.55	RbCl.5HgCl <sub>2</sub> Calc. Composition 8.20% RbCl, 91.8% HgCl <sub>2</sub>
8.46	8.80	25.44	73.67	0.89	
5.68	8.70	25.09	73.46	1.45	RbCl.5HgCl <sub>2</sub> and HgCl <sub>2</sub>
5.10	8.33	24.92	73.93	1.15	
3.43	8.25	22.79	75.72	1.49	HgCl <sub>2</sub>
3.38	8.00	12.68	86.74	0.58	
2.98	7.71	8.40	91.24	...	RbCl.5HgCl <sub>2</sub> Calc. Composition 8.20% RbCl, 91.8% HgCl <sub>2</sub>
1.89	7.64	8.38	91.78	...	
1.50	7.55	8.30	91.81	...	RbCl.5HgCl <sub>2</sub> and HgCl <sub>2</sub>
1.10	7.21	8.07	91.58	...	
0.79	7.16	6.91	93.15	...	HgCl <sub>2</sub>
0.84	7.42	2.27	97.09	...	
none	6.90	none	100.0	...	HgCl <sub>2</sub>

**SOLUBILITY OF MERCURIC CHLORIDE IN METHYL, ETHYL, PROPYL,  
n BUTYL, ISO BUTYL AND ALLYL ALCOHOLS.**

(Etard — Ann. chim. phys. [7] 2, 563, '94.)

NOTE. — For the solubility in Me, Et, and propyl alcohols at room temperature, see Rohland — Z. anorg. Ch. 18, 328, '98; at 8.5°, 20° and 38.2°, see Timofejew — Compt. rend. 112, 1224, '91; in Me and Et alcohols at 25°, see de Bruyn — Z. physik. Ch. 10, 783, '92. The determinations of these investigators agree well with those of Etard, which are given below.

t°.	Grams HgCl <sub>2</sub> per 100 Grams Saturated Solution in:					
	CH <sub>3</sub> OH.	C <sub>2</sub> H <sub>5</sub> OH.	C <sub>3</sub> H <sub>7</sub> OH.	CH <sub>3</sub> (CH <sub>2</sub> ) <sub>3</sub> OH.	(CH <sub>3</sub> ) <sub>2</sub> CHCH <sub>2</sub> OH.	CH <sub>3</sub> .CH.CH <sub>2</sub> OH.
-30	...	14.5	15.0	...	...	...
-20	...	20.1	15.7	13.5	...	21.0
-10	15.2	26.5	16.5	13.7	...	25.5
0	20.1	29.8	17.4	14.0	5.2	30.0
+10	26.3	30.6	18.0	14.3	6.0	37.5
20	34.0	32.0	18.8	14.6	6.8	46.5
25	40.0	32.5	19.5	15.5	7.2	...
30	44.4	33.7	20.0	16.5	7.5	...
40	58.6	35.6	23.0	19.6	9.7	...
60	62.5	41.2	29.8	26.5	17.0	...
80	66.0	47.5	36.8	33.0	24.9	...
100	70.1	54.3	43.8	...	31.7	...
120	73.5	61.5	50.6	...	39.2	...
150	78.5	...	...	...	...	...

**SOLUBILITY OF MERCURIC CHLORIDE IN ACETIC ACID.**

(Etard.)

t°.	Gms. HgCl <sub>2</sub> per 100 Gms. Solution.	t°.	Gms. HgCl <sub>2</sub> per 100 Gms. Solution.	t°.	Gms. HgCl <sub>2</sub> per 100 Gms. Solution.
20	2.5	70	8.5	110	13.6
30	3.5	80	9.7	120	16.5
40	4.7	90	11.0	130	20.7
50	6.0	100	12.4	140	25.2
60	7.2			160	34.8

**SOLUBILITY OF MERCURIC CHLORIDE AND SODIUM CHLORIDE IN ETHYL  
ACETATE AT 40°.**

(Linebarger — Am. Ch. J. 16, 214, '94.)

Mols. per 100 Mols. Acetate.		Gms. per 100 Gms. Acetate		Gms. per 100 Gms. Solution.		Solid Phase.
NaCl.	HgCl <sub>2</sub> .	NaCl.	HgCl <sub>2</sub> .	NaCl.	HgCl <sub>2</sub> .	
0.8	12.9	0.53	39.7	0.53	28.4	HgCl <sub>2</sub>
2.3	12.4	1.53	38.15	1.51	27.61	"
4.3	16.4	2.85	50.44	2.78	33.54	"
9.1	22.85	6.05	86.14	5.60	46.28	"
18.5	34.9	12.29	107.4	10.95	51.76	"
20.0	40.0	13.29	123.0	11.73	55.18	HgCl <sub>2</sub> + NaCl

The double salt (HgCl<sub>2</sub>)<sub>2</sub>.NaCl is formed under proper conditions.

# MERCURIC CHLORIDE

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## SOLUBILITY OF MERCURIC CHLORIDE IN ETHYL ACETATE AND IN ACETONE.

(Etard; von Laszcynski — Ber. 27, 2285, '94; Krug and McElroy — J. Anal. Ch. 6, 186, '92; Linebarger — Am. Ch. J. 16, 214, 94; Aten — Z. physik. Ch. 54, 121, '05.)

NOTE. — The results obtained by the above named investigators were calculated to a common basis and plotted on cross-section paper. The variations which were noted could not be satisfactorily harmonized, and therefore all the results are included in the following table.

### SOLUBILITY.

#### In Ethyl Acetate.

#### In Acetone.

t°.	Grams HgCl <sub>2</sub> per 100 Grams Solution.				Gms. HgCl <sub>2</sub> per 100 Gms. Solution.			
	Laszcynski.	Aten.	Linebarger.	Etard.	K and McE. Laszcynski.	Aten.	Etard.	
-10	...	23.0	...	40	...	...	44.0 *	57.0
0	22.0	23.2	32.0	40	...	49.7	43.0 *	61.7
+10	22.2	23.5	32.5	40	...	52.0	51.0 *—58.9 †	61.7
20	22.5	23.4	32.7	40	...	54	58.5 †	61.7
25	22.7	23.5	33.0	40	37.4	55.2	58.2 †	61.7
30	23.0	...	33.2	40	...	...	...	61.7
40	23.5	...	33.5	40	...	...	...	61.7
50	24.0	...	33.5	41	...	...	...	61.7
60	24.7	...	...	42.5	...	...	...	61.7
80	26.0	...	...	45.2	...	...	...	61.7
100	...	...	...	48.0	...	...	...	...
120	...	...	...	50.8	...	...	...	...
150	...	...	...	55.0	...	...	...	...

(\*) Solid phase HgCl<sub>2</sub>(CH<sub>3</sub>)<sub>2</sub>CO.

(†) Solid Phase HgCl<sub>2</sub>.

100 grams absolute acetone dissolve 143 grams HgCl<sub>2</sub> at 18°.

(Naumann — Ber. 37, 4332, '04.)

## SOLUBILITY OF MERCURIC CHLORIDE IN SEVERAL SOLVENTS.

(Arctowski — Z. anorg. Ch. 6, 267, '94; von Laszcynski, Sulc. — Z. anorg. Ch. 25, 401, '00.)

### In Carbon Bisulphide (A.).

### In Benzene (von L.).

### In Several Solvents at 18-20° (S.).

t°.	Gms. HgCl <sub>2</sub> per 100 Gms. Solution.	t°.	Gms. HgCl <sub>2</sub> per 100 Gms. Solution.	Solvent.	Gms. HgCl <sub>2</sub> per 100 Gms. Solvent.
-10	0.010	15	0.537	CHBr <sub>3</sub>	0.486
0	0.018	41	0.616	CHCl <sub>3</sub>	0.106
10	0.026	55	0.843	CCl <sub>4</sub>	0.002
15	0.032	84	1.769	C <sub>2</sub> H <sub>5</sub> Br	2.010
20	0.042			C <sub>2</sub> H <sub>4</sub> Br <sub>2</sub>	1.530
25	0.053				
30	0.063				

SOLUBILITY OF MERCURIC CHLORIDE IN ABSOLUTE ETHYL ETHER.  
(Etard; Laszcynski; Köhler — Z. anal. Ch. 18, 242, '79.)

t°.	Gms. HgCl <sub>2</sub> per 100 Gms. Solution.	t°.	Gms. HgCl <sub>2</sub> per 100 Gms. Solution.	t°.	Gms. HgCl <sub>2</sub> per 100 Gms. Solution.
-20	6.0	60	6.0	90	7.5
0	6.0	70	6.4	100	8.0
20	6.0	80	7.0	110	8.5

SOLUBILITY OF MERCURIC CHLORIDE AND OF DOUBLE MERCURIC AND  
TETRA METHYL AMINE CHLORIDE (CH<sub>3</sub>)<sub>4</sub>NCl.6HgCl<sub>2</sub> IN AQ. ETHER  
AT 17°. (Strömholm — J. pr. Ch. [2] 66, 443, '02; Z. physik. Chem. 44, 64, '03.)

Molecular Concentration per Liter.			Grams per Liter of Solution.		
H <sub>2</sub> O.	HgCl <sub>2</sub> (*).	HgCl <sub>2</sub> (†).	H <sub>2</sub> O.	HgCl <sub>2</sub> (*).	HgCl <sub>2</sub> (†).
0.0	0.1515	0.0342	0	41.16	9.26
0.0656	0.1795	0.0428	1.18	48.64	11.60
0.1311	0.2069	0.0516	2.36	56.08	14.00
0.1956	0.2339	0.0603	3.52	63.38	16.34
0.2611	0.2489	0.0690	4.70	70.16	18.70
0.3267	0.2849	0.0779	5.88	77.20	21.10
0.3922	0.3100	0.0866	7.06	84.02	23.48

(\*) Results in this column are for solutions in contact with the Solid Phase HgCl<sub>2</sub>. (†) Results in this column are for solutions in contact with the Solid Phase (CH<sub>3</sub>)<sub>4</sub>NCl.6HgCl<sub>2</sub>.

SOLUBILITY OF MERCURIC CHLORIDE AND OF DOUBLE MERCURIC AND  
TETRA METHYL AMINE CHLORIDE IN ALCOHOL-ETHER SOLUTIONS  
AT 17°. (Strömholm.)

Grams C <sub>2</sub> H <sub>5</sub> OH per Liter.	Grams HgCl <sub>2</sub> (*) per Liter.	Grams HgCl <sub>2</sub> (†) per Liter.
0.0	41.16	9.26
4.58	50.00	11.87
9.16	58.76	14.38
13.74	66.96	16.90

SOLUBILITY OF DOUBLE MERCURIC CHLORIDES IN AQUEOUS AND PURE  
ETHER AT 16.6°. (Strömholm.)

Mol. Conc. of HgCl <sub>2</sub> per Liter of:				Gms. HgCl <sub>2</sub> per Liter of:				Solid Phase.
Pure Ether.	Aq. Ether (1).	Aq. Ether (2).	Aq. Ether (3).	Pure Ether.	Aq. Ether (4).	Aq. Ether (5).	Aq. Ether (6).	
0.1515	0.2387	0.2647	0.3196	41.04	64.69	71.71	86.58	HgCl <sub>2</sub>
0.0673	0.0673	0.1293	0.1617	18.23	18.23	35.05	43.79	(CH <sub>3</sub> .C <sub>2</sub> H <sub>5</sub> .C <sub>2</sub> H <sub>5</sub> ) <sub>2</sub> SCl.6HgCl <sub>2</sub>
0.0404	0.0720	0.0835	0.1034	10.95	19.51	22.61	28.01	(CH <sub>3</sub> .C <sub>2</sub> H <sub>5</sub> .C <sub>2</sub> H <sub>5</sub> .C <sub>2</sub> H <sub>5</sub> ) <sub>2</sub> SCl.6HgCl <sub>2</sub>
0.0342	...	0.0706	...	9.26	...	19.10	...	(CH <sub>3</sub> ) <sub>4</sub> NCl.6HgCl <sub>2</sub>
0.0264	...	0.0568	...	7.14	...	15.39	...	(C <sub>2</sub> H <sub>5</sub> ) <sub>2</sub> SCl.6HgCl <sub>2</sub>
0.0209	0.0400	0.0460	0.0594	5.66	10.83	12.48	16.10	(CH <sub>3</sub> .C <sub>2</sub> H <sub>5</sub> ) <sub>2</sub> SCl.6HgCl <sub>2</sub>
0.0063	...	0.0144	...	1.70	...	3.90	...	(CH <sub>3</sub> ) <sub>2</sub> .H <sub>2</sub> NCl.2HgCl <sub>2</sub>

(1) containing 0.21055 mol. H<sub>2</sub>O per liter. (2) 0.2756 mol. H<sub>2</sub>O per liter. (3) 0.421 mol. H<sub>2</sub>O per liter  
(4) containing 3.79 gms. H<sub>2</sub>O per liter. (5) 4.97 gms. H<sub>2</sub>O per liter. (6) 7.59 gms. H<sub>2</sub>O per liter.

## MERCURIO CHLORIDE

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### DISTRIBUTION OF MERCURIC CHLORIDE BETWEEN WATER AND TOLUENE AT 24°.

(Brown — J. Physic. Ch. 2, 50, '98.)

Gms. HgCl <sub>2</sub> per 100 cc.		Gms. HgCl <sub>2</sub> per 100 cc.	
H <sub>2</sub> O Layer.	C <sub>6</sub> H <sub>5</sub> CH <sub>3</sub> Layer.	H <sub>2</sub> O Layer.	C <sub>6</sub> H <sub>5</sub> CH <sub>3</sub> Layer.
0.442	0.0270	1.816	0.130
0.732	0.0488	3.766	0.292
0.780	0.0542	3.754	0.298
1.192	0.0812	6.688*	0.528*

\* This solution saturated.

## MERCUROUS CHLORIDE HgCl.

One liter water dissolves 0.002 gram HgCl at 18°, by conductivity method.

(Kohlrausch — Z. physik. Ch. 50, 356, '04-'05.)

### SOLUBILITY OF MERCUROUS CHLORIDE (CALOMEL) IN AQUEOUS SOLUTIONS OF SODIUM CHLORIDE, BARIUM CHLORIDE, CALCIUM CHLORIDE AND OF HYDROCHLORIC ACID AT 25°.

(Richards and Archibald — Proc. Am. Acad. 37, 345, '01-'02.)

Solid phase in each case. Calomel + about 0.1 gram of mercury.

In Aqueous NaCl.			In Aqueous BaCl <sub>2</sub> .		
Sp. Gr. of Solutions.	Grams per Liter.		Sp. Gr. of Solutions.	Grams per Liter.	
	NaCl.	HgCl <sub>2</sub> .		BaCl <sub>2</sub> .	HgCl <sub>2</sub> .
...	5.85	0.0041	1.088	104.15	0.044
1.040	58.50	0.041	1.134	156.22	0.088
1.078	119.00	0.129	1.174	208.30	0.107
1.093	148.25	0.194	1.263	312.45	0.231
1.142	222.3	0.380			
1.188	292.5	0.643			

In Aqueous CaCl <sub>2</sub> .			In Aqueous HCl.		
Sp. Gr. of Solutions.	Grams per Liter.		Sp. Gr. of Solutions.	Grams per Liter.	
	CaCl <sub>2</sub> .	HgCl <sub>2</sub> .		HCl.	HgCl <sub>2</sub> .
...	39.96	0.022	...	31.69	0.034
...	55.5	0.033	...	36.46	0.048
1.064	111.0	0.081	1.042	95.43	0.207
1.105	138.75	0.118	1.069	158.4	0.399
1.151	195.36	0.231	1.091	209.2	0.548
1.205	257.52	0.322	1.114	267.3	0.654
1.243	324.67	0.430	1.119	278.7	0.675
1.315	432.9	0.518	1.132	317.3	0.670
1.358	499.5	0.510	1.153	364.6	0.673

100 grams bromoform, CHBr<sub>3</sub>, dissolve 0.055 gram HgCl at 18°-20°.

(Sulc. — Z. anorg. Ch. 25, 401, '00.)

**MERCURIO CYANIDE**  $\text{Hg}(\text{CN})_2$ .

## SOLUBILITY IN SEVERAL SOLVENTS.

Solvent.	t°.	Gms. $\text{Hg}(\text{CN})_2$ per 100 Gms. Solvent.	Observer.
Water	-0.45	about 11.0	(Guthrie — Phil. Mag. [5] 6, 40, '78.)
"	15.2	8.0	(Wittstein.)
"	101.1	53.85	(Griffiths.)
Abs. Ethyl Alcohol	19.5	10.1	(de Bruyn — Z. physik. Ch. 10, 784, '92.)
Abs. Methyl Alcohol	19.5	44.2	" "
Glycerine	15.5	27.0	

## SOLUBILITIES OF MERCURIC CYANIDE DOUBLE SALTS IN WATER AND IN ALCOHOL.

Double Salt.	t°.	Gms. per 100 Grams.		Observer.
		Water.	Alcohol.	
$\text{Hg}(\text{CN})_2 \cdot 2\text{KCN}$	cold	22.7	...	(Frommuller — Ber. 11, 92, '78.)
$\text{Hg}(\text{CN})_2 \cdot 2\text{TiCN}$	1°	12.6	...	
$\text{Hg}(\text{CN})_2 \cdot 2\text{TiCN}$	10°	9.7	...	
$2\text{Hg}(\text{CN})_2 \cdot \text{CaBr}_2 \cdot 5\text{H}_2\text{O}$	cold	100.0	50.0	(Custer.)
$2\text{Hg}(\text{CN})_2 \cdot \text{CaBr}_2 \cdot 5\text{H}_2\text{O}$	boiling	400.0	100.0	"
$\text{Hg}(\text{CN})_2 \cdot \text{KCl} \cdot \text{H}_2\text{O}$	18°	14.81	...	(Brett.)
$\text{Hg}(\text{CN})_2 \cdot \text{KBr} \cdot 2\text{H}_2\text{O}$	18°	7.49	...	"
$\text{Hg}(\text{CN})_2 \cdot \text{KBr} \cdot 2\text{H}_2\text{O}$	boiling	100.0+	...	"
$\text{Hg}(\text{CN})_2 \cdot \text{BaI}_2 \cdot 4\text{H}_2\text{O}$	cold	6.42	4.42	(Custer.)
$\text{Hg}(\text{CN})_2 \cdot \text{BaI}_2 \cdot 4\text{H}_2\text{O}$	boiling	250.0	62.5 (90% Alc.)	"
$\text{Hg}(\text{CN})_2 \cdot \text{KI}$	cold	6.2	1.04 (34° B Alc.)	(Caillot.)
$\text{Hg}(\text{CN})_2 \cdot \text{NaI} \cdot 2\text{H}_2\text{O}$	18°	22.2	15.4 (90% Alc.)	(Custer.)
$\text{Hg}(\text{CN})_2 \cdot \text{SrI}_2 \cdot 6\text{H}_2\text{O}$	18°	14.3	25.0 (90% Alc.)	"

SOLUBILITY OF MERCURIC CYANIDE IN ORGANIC SOLVENTS  
AT 18°-20°.

(Sulc — Z. anorg. Ch. 25, 401, '00.)

Solvent.	Formula.	G. $\text{Hg}(\text{CN})_2$ per 100 Gms. Solvent.
Bromoform	$\text{CHBr}_3$	0.005
Carbon Tetra Chloride	$\text{CCl}_4$	0.001
Ethyl Bromide	$\text{C}_2\text{H}_5\text{Br}$	0.013
Ethylene Di Bromide	$\text{C}_2\text{H}_4\text{Br}_2$	0.001

**MERCURY FULMINATE**  $\text{C}_2\text{HgN}_2\text{O}_2$ .One liter of water dissolves 1.738 - 1.784 grams  $\text{C}_2\text{HgN}_2\text{O}_2$  at 12°.

(Holleman — Rec. trav. chim. 15, 159, '96.)

**MERCURIO IODIDE**  $\text{HgI}_2$ .

## SOLUBILITY IN WATER.

t°.	Grams $\text{HgI}_2$ per Liter.	Observer.
18	0.0004 (conductivity method)	(Kohlrausch — Z. physik. Ch. 50, 356, '04-'05.)
17.5	0.040	(Bourgoin — Bull. soc. chim. [2] 42, '84.)
22	0.054	(Rohland — Z. anorg. Ch. 18, 328, '98.)





## SOLUBILITY OF MERCURIC IODIDE IN CARBON BISULPHIDE.

(Linebarger — Am. Ch. J. 16, 214, '94; Arctowski — Z. anorg. Ch. 6, 267, '94; 11, 274, '95.)

t°.	Gms. HgI <sub>2</sub> per 100 Gms. Solution.	t°.	Gms. HgI <sub>2</sub> per 100 Gms. Solution.	t°.	Gms. HgI <sub>2</sub> per 100 Gms. Solution.
-116	0.017	-5	0.141	15	0.271
-93	0.023	0	0.173	20	0.320
-86.5	0.024	+5	0.207	25	0.382
-10	0.107	10	0.239	30	0.445

## SOLUBILITY OF MERCURIC IODIDE IN SEVERAL ORGANIC SOLVENTS.

(Sulc — Z. anorg. Ch. 25, 401, '00.)

Solvent.	Formula.	t°.	Gms. HgI <sub>2</sub> per 100 Gms. Solvent.
Chloroform	CHCl <sub>3</sub>	18-20	0.040
Chloroform	CHCl <sub>3</sub>	61 (b. pt.)	0.163
Bromoform	CHBr <sub>3</sub>	18-20	0.486
Tetra Chlor Methane	CCl <sub>4</sub>	18-20	0.006
Tetra Chlor Methane	CCl <sub>4</sub>	75 (b. pt.)	0.094
Ethyl Bromide	C <sub>2</sub> H <sub>5</sub> Br	18-20	0.643
Ethyl Bromide	C <sub>2</sub> H <sub>5</sub> Br	38° (b. pt.)	0.773
Ethylene Di Bromide	C <sub>2</sub> H <sub>4</sub> Br <sub>2</sub>	18-20	0.748
Ethyl Iodide	C <sub>2</sub> H <sub>5</sub> I	18-20	2.041
Ethylene Di Chloride	C <sub>2</sub> H <sub>4</sub> Cl <sub>2</sub>	85.5° (b. pt.)	1.200
Iso Butyl Chloride	(CH <sub>3</sub> ) <sub>2</sub> CHCH <sub>2</sub> Cl	69	0.328
Methyl Formate	HCOOCH <sub>3</sub>	36-38	1.166
Ethyl Formate	HCOOC <sub>2</sub> H <sub>5</sub>	52-55	2.150
Methyl Acetate	CH <sub>3</sub> COOCH <sub>3</sub>	56-59	2.500
Acetal	CH <sub>3</sub> CH(OC <sub>2</sub> H <sub>5</sub> ) <sub>2</sub>	105	2.000
Epi Chlor Hydrine	CH <sub>2</sub> O.CH.CH <sub>2</sub> Cl	117	6.113
Hexane	C <sub>6</sub> H <sub>14</sub>	67	0.072

## SOLUBILITY OF MERCURIC IODIDE IN ETHER AND IN METHYLENE IODIDE.

In Ether.		In Methylene Iodide.	
(Sulc; Laszcynski.)		(Retgers — Z. anorg. Ch. 3, 253, '93.)	
t°.	Gms. HgI <sub>2</sub> per 100 Gms. (C <sub>2</sub> H <sub>5</sub> ) <sub>2</sub> O.	t°.	Gms. HgI <sub>2</sub> per 100 Gms. CH <sub>2</sub> I <sub>2</sub> .
0	0.62	15	2.5
36	0.97	100	16.6
35 (b. pt.)	0.47 (Sulc)	180	58.0

## SOLUBILITY OF MERCURIC IODIDE IN FATTY BODIES.

(Mehu — J. pharm. chim. [5] 12, 249, '85.)

Solvent.	t°.	Gms. HgI <sub>2</sub> per 100 Gms. Solvent.	Solvent.	t°.	Gms. HgI <sub>2</sub> per 100 Gms. Solvent.
Bitter Almond Oil	25	0.5	Vaseline	25	0.025
Bitter Almond Oil	100	1.3	Vaseline	100	0.20
Castor Oil	25	4.0	Poppy Oil	25	1.0
Castor Oil	100	20.0	Olive Oil	25	0.4
Nut Oil	100	1.3	Carbolic Acid	100	2.0

100 grams oil of bitter almonds dissolve 5.0 grams HgI<sub>2</sub>.KI at 25°.

(Mehu.)

# MERCURY OXIDE

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## MERCURY OXIDE HgO.

SOLUBILITY IN WATER.  
(Schick — Z. physik. Ch. 42, 163, '01-'02.)

t°.	Grams per 1000 cc. Solution.	
25	0.0518 yellow HgO	0.0513 red HgO
100	0.410 yellow HgO	0.379 red HgO

## EQUILIBRIUM IN THE SYSTEM, MERCURY OXIDE, SULPHUR TRI-OXIDE, WATER.

(Hoitsema — Z. physik. Chem. 17, 651, '95.)

Results expressed in molecules per sum of 100 molecules of the three components of the system.

Results at 25°.				Results at 50°.			
Liquid Phase.			Solid Phase.	Liquid Phase.			Solid Phase.
H <sub>2</sub> O.	SO <sub>3</sub> .	HgO.		H <sub>2</sub> O.	SO <sub>3</sub> .	HgO.	
98.5	1.24	0.33	3HgO.SO <sub>3</sub>	98.9	0.96	0.17	3HgO.SO <sub>3</sub>
96.6	2.49	0.92	"	96.0	3.05	0.93	"
94.4	3.93	1.65	"	93.2	4.92	1.90	"
93.9	4.24	1.85	3HgO.SO <sub>3</sub> and 3HgO.2SO <sub>3</sub> .2H <sub>2</sub> O	92.8	5.10	2.09	"
94.4	4.52	2.12		92.8	5.16	2.06	"
93.4	4.65	1.94	3HgO.2SO <sub>3</sub> .2H <sub>2</sub> O	92.5	5.34	2.12	"
92.9*	4.81	2.29	3HgO.SO <sub>3</sub>	92.2	5.57	2.20	3HgO.SO <sub>3</sub> and 3HgO.2SO <sub>3</sub> .2H <sub>2</sub> O
92.9	5.11	1.98	3HgO.2SO <sub>3</sub> .2H <sub>2</sub> O				
92.3*	5.20	2.54	3HgO.SO <sub>3</sub>	92.1	5.75	2.11	3HgO.2SO <sub>3</sub> .2H <sub>2</sub> O
92.3	5.58	2.09	3HgO.2SO <sub>3</sub> .2H <sub>2</sub> O	92.0	5.80	2.16	"
92.1	5.81	2.08	"	91.2*	6.27	2.56	3HgO.SO <sub>3</sub> and HgO.SO <sub>3</sub>
91.9	5.97	2.90	3HgO.SO <sub>3</sub>				
91.9	6.15	2.05	3HgO.2SO <sub>3</sub> .2H <sub>2</sub> O	91.5	6.34	2.19	3HgO.2SO <sub>3</sub> .2H <sub>2</sub> O and HgO.SO <sub>3</sub>
91.3	6.54	2.13	"				
91.2	6.77	2.02	HgO.SO <sub>3</sub> .H <sub>2</sub> O	91.3*	6.37	2.30	HgO.SO <sub>3</sub>
91.3	6.90	1.80	"	91.6	6.69	1.75	"
91.3	7.67	1.01	"	91.1	8.32	0.57	"
91.3	7.84	0.89	HgO.SO <sub>3</sub> .H <sub>2</sub> O and HgO.SO <sub>3</sub>	89.6	10.2	0.23	"
91.0	8.36	0.69		31.6	68.4	0.03	"
90.5	8.95	0.53	HgO.SO <sub>3</sub>				
89.2	10.6	0.22	"				
75.8	24.2	trace	"				
39.2	60.7	trace	"				

\* Indicates unstable equilibrium.

## MERCUROUS SULPHATE Hg<sub>2</sub>SO<sub>4</sub>.

SOLUBILITY IN WATER, IN SULPHURIC ACID AND IN POTASSIUM SULPHATE AT 25°.

(Drucker — Z. anorg. Ch. 28, 362, '01; Wright and Thomson — Phil. Mag. [5] 17, 288; 19, 1, '84-'85; Wilsmore — Z. physik. Ch. 35, 305, '00.)

Solvent.	Hg <sub>2</sub> SO <sub>4</sub> per Liter.	
	Gram Mols.	Grams.
Water	11.71 10 <sup>-4</sup>	0.058(0.047 W. and T., 0.039 W.)
Aq.H <sub>2</sub> SO <sub>4</sub> ( 1.96 gms. per liter)	8.31 "	0.041
Aq.H <sub>2</sub> SO <sub>4</sub> ( 4.90 gms. per liter)	8.78 "	0.044
Aq.H <sub>2</sub> SO <sub>4</sub> ( 9.80 gms. per liter)	8.04 "	0.040
Aq.K <sub>2</sub> SO <sub>4</sub> (34.87 gms. per liter)	9.05 "	0.045

**METHANE**  $\text{CH}_4$ .SOLUBILITY IN WATER.  
(Winkler — Ber. 34, 1418, '01.)

t°.	$\beta$ .	$\beta'$ .	g.	t°.	$\beta$ .	$\beta'$ .	g.
0	0.05563	0.05530	0.00396	40	0.02369	0.02198	0.00159
5	0.04805	0.04764	0.00341	50	0.02134	0.01876	0.00136
10	0.04177	0.04127	0.00296	60	0.01954	0.01571	0.00115
15	0.03690	0.03628	0.00260	70	0.01825	0.01265	0.00093
20	0.03308	0.03233	0.00232	80	0.01770	0.00944	0.00070
25	0.03006	0.02913	0.00209	90	0.01735	0.00535	0.00040
30	0.02762	0.02648	0.00191	100	0.01700	0.00000	0.00000

For the values of  $\beta$ ,  $\beta'$  and  $q$  see Ethane, page 133.

## SOLUBILITY OF METHANE IN METHYL ALCOHOL AND IN ACETONE.

(Levi — Gazz. chim. ital. II, 513, '01; abs. in Z. physik. Ch. 41, 110, '02.)

In methyl alcohol *l* (Ostwald expression, see page 105) = 0.5644 — 0.0046 *t* — 0.00004 *t*<sup>2</sup>.

In acetone *l* (Ostwald expression) = 0.5906 — 0.00613 *t* — 0.0000146 *t*<sup>2</sup>.

From which is calculated the following values:

In Methyl Alcohol.				In Acetone.			
t°.	<i>l</i> .	t°.	<i>l</i> .	t°.	<i>l</i> .	t°.	<i>l</i> .
0	0.5644	40	0.3164	0	0.5906	40	0.3220
10	0.5144	50	0.2344	10	0.5278	50	0.2476
20	0.4564	60	0.1444	20	0.4622	60	0.1702
30	0.3904	70	0.0464	30	0.3936	70	0.0900

Tetra Chlor **METHANE**  $\text{CCl}_4$  (Carbon Tetra Chloride).

## SOLUBILITY IN WATER.

(Rex — Z. physik. Chem. 55, 355, '06.)

t°.	0°.	10°.	20°.	30°.
Grams $\text{CCl}_4$ per 100 gms. $\text{H}_2\text{O}$	1.097	0.083	0.080	0.085

Tri Phenyl **METHANE**  $\text{CH}(\text{C}_6\text{H}_5)_3$ .

## SOLUBILITY IN ANILIN.

(Hartley and Thomas — J. Ch. Soc. 89, 1026, '06.)

By synthetic method, see page 9.

t°.	Gms. $\text{CH}(\text{C}_6\text{H}_5)_3$ per 100 Gms. Solution.	Mol. per cent $\text{CH}(\text{C}_6\text{H}_5)_3$ .	Solid Phase.	t°.	Gms. $\text{CH}(\text{C}_6\text{H}_5)_3$ per 100 Gms. Solution.	Mol. per cent $\text{CH}(\text{C}_6\text{H}_5)_3$ .	Solid Phase.
23.0	5.4	1.85	$\text{CH}(\text{C}_6\text{H}_5)_3 \cdot \text{C}_6\text{H}_5\text{NH}_2$ rhombs	71.3	67.9	44.6	$\text{CH}(\text{C}_6\text{H}_5)_3 \cdot \text{C}_6\text{H}_5\text{NH}_2$ rhombs
35.3	9.5	3.8	"	71.6	71.7	49.1	"
43.0	13.5	5.6	"	71.2	76.3	55.1	"
52.1	21.9	9.7	"	70.6	78.3	57.9	"
61.4	36.5	17.8	"	71.6	82.1	63.5	$\text{CH}(\text{C}_6\text{H}_5)_3$ monoclinic
66.0	47.2	25.4	"	74.3	84.9	68.2	"
68.7	54.8	31.6	"	82.1	91.7	80.9	"
70.1	64.6	40.9	"	87.3	96.1	90.2	"

## SOLUBILITY OF TRI PHENYL METHANE IN BENZENE.

(Linebarger — Am. Ch. J. 15, 45, '93.)

(Hartley and Thomas.)

t°.	Gms. CH(C <sub>6</sub> H <sub>5</sub> ) <sub>3</sub> per 100 Gms. C <sub>6</sub> H <sub>6</sub> .	Solid Phase.	t°.	Gms. CH(C <sub>6</sub> H <sub>5</sub> ) <sub>3</sub> per 100 Gms. Solution.	Mol. per cent CH(C <sub>6</sub> H <sub>5</sub> ) <sub>3</sub> .	Solid Phase.
3.9	3.90	C <sub>6</sub> H <sub>6</sub> + CH(C <sub>6</sub> H <sub>5</sub> ) <sub>3</sub> .C <sub>6</sub> H <sub>6</sub>	33	12.6	4.4	CH(C <sub>6</sub> H <sub>5</sub> ) <sub>3</sub> .C <sub>6</sub> H <sub>6</sub> rhombs
4.0	4.06	CH(C <sub>6</sub> H <sub>5</sub> ) <sub>3</sub> .C <sub>6</sub> H <sub>6</sub>	49.4	24.0	8.8	"
12.5	5.18	"	65.6	38.9	17.2	"
16.1	6.83	"	73.8	57.5	30.2	"
19.4	7.24	"	77.1	67.4	39.7	"
23.1	8.95	"	77.9	76.3	50.7	"
37.5	10.48	(C <sub>6</sub> H <sub>5</sub> ) <sub>3</sub> CH.C <sub>6</sub> H <sub>6</sub> + CH(C <sub>6</sub> H <sub>5</sub> ) <sub>3</sub>	77.5	80.2	56.4	"
42.0	19.61	CH(C <sub>6</sub> H <sub>5</sub> ) <sub>3</sub>	76.2	84.1	62.8	"
44.6	22.64	"	74.6	87.5	69.1	CH(C <sub>6</sub> H <sub>5</sub> ) <sub>3</sub> monoclinic
50.1	30.64	"	76.0	89.0	72.2	"
55.5	40.51	"	78.8	90.5	75.3	"
71.0	140.00	"	82.3	93.1	81.3	"
76.2	319.67	"	86.6	95.7	87.8	"

NOTE.—Hartley and Thomas call attention to the inaccuracy of Linebarger's results and the correctness of Kuriloff's determinations (Z. physik. Chem. 22, 547, '97).

## SOLUBILITY OF TRI PHENYL METHANE IN CARBON BISULPHIDE.

(Etard — Ann. chim. phys. [7] 2, 570, '94; below -80°, Arctowski — Z. anorg. Ch. 11, 273, '95.)

t°.	Gms. CH(C <sub>6</sub> H <sub>5</sub> ) <sub>3</sub> per 100 Gms. Solution.	t°.	Gms. CH(C <sub>6</sub> H <sub>5</sub> ) <sub>3</sub> per 100 Gms. Solution.	t°.	Gms. CH(C <sub>6</sub> H <sub>5</sub> ) <sub>3</sub> per 100 Gms. Solution.
-113.5	0.98	-40	7.5	40	63.7
-102	1.24	-20	13.7	50	72.4
-91	1.56	0	25.8	60	78.6
-83	1.91	+10	38.7	70	85.6
-60	3.4	20	43.2	80	92.2
		30	52.9		

## SOLUBILITY OF TRI PHENYL METHANE IN HEXANE AND IN CHLOROFORM.

(Etard.)

t°.	Gms. CH(C <sub>6</sub> H <sub>5</sub> ) <sub>3</sub> per 100 Gms. Solution in:		t°.	Gms. CH(C <sub>6</sub> H <sub>5</sub> ) <sub>3</sub> per 100 Gms. Solution in:	
	Hexane.	Chloroform.		Hexane.	Chloroform.
-50	...	10.5	30	12.5	48.8
-30	1.2	15.2	40	20.0	56.1
-20	1.6	19.0	50	25.8	63.8
-10	2.2	23.5	60	45.7	71.7
0	3.5	28.9	70	62.0	79.8
+10	5.6	35.0	80	78.5	87.2
20	8.3	41.5	90	97.0	...

## SOLUBILITY OF TRI PHENYL METHANE IN PYRIDINE.

(Hartley and Thomas — J. Ch. Soc. 89, 1028, '06.)

Synthetic method used, see note, page 9.

t°.	Gms. CH(C <sub>6</sub> H <sub>5</sub> ) <sub>3</sub> per 100 Gms. Solution.	Mol. per cent CH(C <sub>6</sub> H <sub>5</sub> ) <sub>3</sub> .	Solid Phase.	t°.	Gms. CH(C <sub>6</sub> H <sub>5</sub> ) <sub>3</sub> per 100 Gms. Solution.	Mol. per cent CH(C <sub>6</sub> H <sub>5</sub> ) <sub>3</sub> .	Solid Phase.
22.8	46.2	22.0	CH(C <sub>6</sub> H <sub>5</sub> ) <sub>3</sub> monoclinic	59.3	75.6	50.3	CH(C <sub>6</sub> H <sub>5</sub> ) <sub>3</sub>
31.7	53.3	27.2	"	67.8	81.9	59.7	"
37.9	57.6	30.7	"	72.8	85.7	66.4	"
48.7	66.6	39.5	"	80.6	91.5	77.2	"
53.1	70.1	43.5	"	86.8	95.8	88.1	"

## SOLUBILITY OF TRI PHENYL METHANE IN:

(Hartley and Thomas.)

Pyrrole.				Thiophene.			
t°.	Gms. CH(C <sub>6</sub> H <sub>5</sub> ) <sub>3</sub> per 100 Gms. Sol.	Mol. per cent CH(C <sub>6</sub> H <sub>5</sub> ) <sub>3</sub> .	Solid Phase.	t°.	Gms. CH(C <sub>6</sub> H <sub>5</sub> ) <sub>3</sub> per 100 Gms. Solution.	Mol. per cent CH(C <sub>6</sub> H <sub>5</sub> ) <sub>3</sub> .	Solid Phase.
24.6	24.3	8.1	CH(C <sub>6</sub> H <sub>5</sub> ) <sub>3</sub> .C <sub>4</sub> H <sub>7</sub> NH rhombs	25.7	26.0	10.8	CH(C <sub>6</sub> H <sub>5</sub> ) <sub>3</sub> .C <sub>4</sub> H <sub>7</sub> S rhombs
29.0	29.8	10.4	"	33.5	31.1	13.5	"
31.5	33.4	12.1	"	44.0	43.6	21.1	"
36.8	40.6	15.8	CH(C <sub>6</sub> H <sub>5</sub> ) <sub>3</sub> monoclinic	47.6	48.4	24.4	"
42.7	49.1	20.9	"	53.5	58.7	32.9	"
46.9	56.0	25.9	"	57.4	70.2	44.7	"
53.2	63.9	32.8	"	57.6	74.8	50.6	"
60.0	72.3	41.8	"	62.7	78.7	56.0	CH(C <sub>6</sub> H <sub>5</sub> ) <sub>3</sub> monoclinic
63.9	76.7	47.4	"	67.0	81.9	60.8	"
68.5	81.9	55.6	"	67.2	82.1	61.3	"
71.1	84.4	59.8	"	74.2	87.4	70.5	"
80.0	91.5	74.8	"	79.0	90.3	76.3	"
89.2	97.6	91.8	"	87.2	96.2	89.9	"

## METHYL ACETATE, Butyrate and Propionate.

## SOLUBILITY IN WATER AT 22°.

(Traube — Ber. 17, 2304, '84.)

100 grams H<sub>2</sub>O dissolve 25.0 grams CH<sub>3</sub>COOCH<sub>3</sub>; 1.7 grams C<sub>4</sub>H<sub>7</sub>COOCH<sub>3</sub>; 5.0 grams C<sub>3</sub>H<sub>7</sub>COOCH<sub>3</sub>.

## METHYL IODIDE, Methylene Chloride and Methylene Bromide.

## SOLUBILITY OF EACH IN WATER.

(Rex — Z. physik. Chem. 55, 355, '06.)

t°.	Grams per 100 Grams H <sub>2</sub> O.		
	CH <sub>3</sub> I.	CH <sub>2</sub> Cl <sub>2</sub> .	CH <sub>2</sub> Br <sub>2</sub> .
0	1.565	2.363	1.173
10	1.446	2.122	1.146
20	1.419	2.000	1.148
30	1.429	1.969	1.176

**METHYL BUTYRATE,**

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**METHYL BUTYRATE, METHYL VALERATE.****SOLUBILITY OF EACH IN AQUEOUS ALCOHOL MIXTURES.**

(Bancroft — Phys. Rev. 3, 193, '95.)

100 cc. H<sub>2</sub>O dissolve 1.15 cc. methyl butyrate at 20°.

cc. Alcohol in Mixture.	cc. H <sub>2</sub> O Added.*		cc. Alcohol in Mixture.	cc. H <sub>2</sub> O Added.* Valerate.
	Butyrate.	Valerate.		
3	2.34	1.66	27	41.15
6	6.96	5.06	30	52.37
9	12.62	9.03	33	62.25
12	19.45	13.40	36	74.15
15	28.13	18.41	39	91.45
18	33.80	24.00	42	∞
21	55.64	30.09		
24	∞	36.72		

\* cc. H<sub>2</sub>O added to cause the separation of a second phase in mixtures of the given amounts of ethyl alcohol and 3 cc. portions of methyl butyrate and of methyl valerate respectively.

**METHYL ETHYL KETONE CH<sub>3</sub>.CO.C<sub>2</sub>H<sub>5</sub>.****SOLUBILITY IN WATER.**

(Rothmund — Z. physik. Chem. 26, 475, '98.)

By synthetic method, see Note, page 9.

t°.	Gms. Ketone per 100 Gms.		t°.	Gms. Ketone per 100 Gms.	
	Aq. Layer.	Ketone Layer.		Aq. Layer.	Ketone Layer.
-10	34.5	89.7	90	16.1	84.8
+10	26.1	90.0	110	17.7	80.0
30	21.9	89.9	130	21.8	71.9
50	17.5	89.0	140	26.0	64.0
70	16.2	85.7	151.8 (crit. temp.)	44.2	

**MOLYBDENUM TRIOXIDE MoO<sub>3</sub>.**100 gms. cold H<sub>2</sub>O dissolve 0.187 gm. MoO<sub>3</sub>.

(Dumas; Buchholz.)

100 gms. hot H<sub>2</sub>O dissolve 0.104 gm. MoO<sub>3</sub>.

(Haichett.)

**MORPHINE C<sub>17</sub>H<sub>19</sub>NO<sub>3</sub>.H<sub>2</sub>O.****SOLUBILITY IN SEVERAL SOLVENTS.**

(U. S. P.; Müller — Apoth.-Ztg. 18, 257, '03.)

Solvent.	Gms. Morphine per 100 Gms. Solution.			Solvent.	Gms. Morphine per 100 Gms. Solution.	
	At 18°-22°.	At 25°.	At 80°.		At 18°-22°.	At 25°.
Water	0.0283	0.030	0.0961	Chloroform	0.0655	0.0555
Alcohol	...	0.600	1.31 (60°)	Amyl Alcohol	...	0.8810
Ether	0.0131	0.0224	...	Ethyl Acetate	0.1861	0.1905
Ether sat. with H <sub>2</sub> O	0.0094	...	...	Petroleum Ether	0.0854	...
H <sub>2</sub> O sat. with Ether	0.0447	...	...	Carbon Tetra Chloride	0.0156	0.032 (17°)
Benzene	0.0625	...	...	Glycerine	0.45 (15.5°)	...

**SOLUBILITY OF MORPHINE IN AQUEOUS SOLUTIONS OF SALTS AND BASES AT ROOM TEMPERATURE, SHAKEN EIGHT DAYS.**

(Dieterich — Pharm. Centr. 31, 395, '90.)

Aq. Salt or Base.	In N/10 Salt or Base.		In N/1 Salt or Base.	
	Grams per Liter.		Grams per Liter.	
	Salt or Base.	Morphine.	Salt or Base.	Morphine.
NH <sub>4</sub> OH	3.51	0.20	35.08	0.505
(NH <sub>4</sub> ) <sub>2</sub> CO <sub>3</sub>	4.80	0.031	48.03	0.040
KOH	4.62	2.78	46.16	...
K <sub>2</sub> CO <sub>3</sub>	6.92	0.20	69.15	0.379
KHCO <sub>3</sub>	10.02	0.024	100.16	0.040
NaOH	4.00	3.33	40.05	...
Na <sub>2</sub> CO <sub>3</sub>	5.30	0.09	53.03	0.14
NaHCO <sub>3</sub>	8.41	0.032	84.06	0.044
Ca(OH) <sub>2</sub> (sat.)	...	1.00 (25°)	...	...

**MORPHINE ACETATE** CH<sub>3</sub>COOH.C<sub>17</sub>H<sub>19</sub>NO<sub>3</sub>.3H<sub>2</sub>O, Morphine Hydrochloride HCl.C<sub>17</sub>H<sub>19</sub>NO<sub>3</sub>.3H<sub>2</sub>O, Morphine Sulphate H<sub>2</sub>SO<sub>4</sub>.(C<sub>17</sub>H<sub>19</sub>NO<sub>3</sub>)<sub>2</sub>.5H<sub>2</sub>O, and Apo Morphine Hydrochloride HCl.C<sub>17</sub>H<sub>17</sub>NO<sub>3</sub>.

**SOLUBILITY IN SEVERAL SOLVENTS.**

(U. S. P.)

Solvent.	Grams per 100 Grams of Solvent.							
	Acetate.		Hydrochloride.		Sulphate.		Apo M. Hydrochloride.	
	25°.	80°.	25°.	80°.	25°.	80°.	25°.	80°.
Water	44.9	50.0	5.81	200.0	6.53	166.6	2.53	6.25
Alcohol	4.6	40.0*	2.4	2.8*	0.22	0.53*	2.62	3.33
Chloroform	0.21	...	...	...	...	...	0.026	...
Ether	...	...	...	...	...	...	0.053	...
Glycerine	19.2	...	20.0†	...	...	...	...	...

\* 60°.

† 15.5°.

100 gms. H<sub>2</sub>O dissolve 1.69 gms. apo morphine hydrochloride at 15.5°, and 2.04 gms. at 25°.

100 gms. 90% alcohol dissolve 1.96 gms. apo morphine hydrochloride at 25°.

(Dolt — Pharm. J. [4] 22, 345, '75.)

100 gms. H<sub>2</sub>O dissolve 4.17 gms. morphine sulphate at 15°.

(Power — Am. J. Pharm. March, '82.)

**MUSTARD OIL** Allyl Isosulphocyanic Ester CS:NC<sub>2</sub>H<sub>5</sub>

**SOLUBILITY IN SULPHUR BY SYNTHETIC METHOD.** See Note, p. 9.

(Alexejew—Ann. Physik. Chem. 28, 305, '86.)

t°.	Grams Mustard Oil per 100 grams.	
	Sulphur Layer.	Mustard Oil Layer.
90	10	72
100	12	67
110	15	62
120	23	51
124 (crit. temp.)	35	



**$\alpha$  NAPHTHYLAMINE**

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**$\alpha$  NAPHTHYLAMINE** *p* Sulphonic Acid (Naphthion Acid), 1 : 4  
 $\alpha$   $C_{10}H_7NH_2SO_3H$  and  $\alpha$  Naphthalamine *o* Sulphonic Acid, 1 : 2  
 $\alpha$   $C_{10}H_6NH_2SO_3H$ .

**SOLUBILITY OF EACH IN WATER.**

(Dolinski — Ber. 38, 1836, '05.)

t°.	Gms. per 100 Gms. H <sub>2</sub> O.		t°.	Gms. per 100 Gms. H <sub>2</sub> O.	
	<i>p</i> Sulphonic Ac.	<i>o</i> Sulphonic Ac.		<i>p</i> Sulphonic Ac.	<i>o</i> Sulphonic Ac.
0	0.027	0.24	50	0.059	0.81
10	0.029	0.32	60	0.075	1.01
20	0.031	0.41	70	0.097	1.37
30	0.037	0.52	80	0.130	1.80
40	0.048	0.65	90	0.175	2.40
			100	0.228	3.19

**NAPHTHALENE**  $C_{10}H_8$ .

**SOLUBILITY IN METHYL, ETHYL, AND PROPYL ALCOHOLS.**

(Speyers — Am. J. Sci. [4] 14, 204, '02; at 10.5°, de Bruyn — Z. physik. Chem. 10, 784, '92; at 11°, Timofeiew — Compt. rend. 112, 1137, '91.)

The original results were calculated to a common basis, plotted on cross-section paper, and the following table read from the curves.

t°.	In Methyl Alcohol.		In Ethyl Alcohol.		In Propyl Alcohol.	
	Wt. of 1 cc. Solution.	Gms. $C_{10}H_8$ per 100 Gms. $CH_3OH$ .	Wt. of 1 cc. Solution.	Gms. $C_{10}H_8$ per 100 Gms. $C_2H_5OH$ .	Wt. of 1 cc. Solution.	Gms. $C_{10}H_8$ per 100 Gms. $C_3H_7OH$ .
0	0.8194	3.48	0.8175	5.0	0.8285	4.45
10	0.812	5.6	0.814	7.0	0.824	5.6
20	0.807	8.2	0.810	9.8	0.821	8.2
25	0.805	9.6	0.809	11.3	0.820	9.6
30	0.804	11.2	0.809	13.4	0.820	11.4
40	0.805	16.2	0.812	19.5	0.823	16.4
50	0.813	26.0	0.822	35.0	0.837	26.0
60	0.837	50.0	0.855	67.0	0.867	50.0
65	0.870	...	0.890	96.0	0.897	80.0
70	0.9023 (68°)	...	0.930	179.0	0.933	134.1 (68.5°)

**SOLUBILITY OF NAPHTHALENE IN AQUEOUS ACETONE.**

(Cady — J. Physic. Ch. 2, 168, '98.)

t°.	Grams per 100 Grams Solution.		
	Acetone.	Water.	Naphthalene.
65.5	10.0	89.92	0.05
55.3	19.91	80.0	0.09
45	29.92	69.67	0.41
38	40.81	58.22	0.97
32.2	48.67	48.68	2.65
28.5	57.43	36.64	5.93
28.2	60.43	25.75	13.82

The isotherms for intervals of 10° lie so close together that they are practically indistinguishable for the greater part of their length.

## SOLUBILITY OF NAPHTHALENE IN:

t°.	Chloroform.	Carbon Tetra Chloride.		Carbon Di Sulphide.
	(Speyers; Etard.)	(Schröder — Z. physik. Ch. 12, 457, '93.)	(Arctowski — Compt. rend, 121, 123, '95; Etard.)	
	Wt. of 1 cc. Solution.	Gms. C <sub>10</sub> H <sub>8</sub> per 100 Grams CHCl <sub>3</sub> .	Gms. C <sub>10</sub> H <sub>8</sub> per 100 Gms. Sat. Solution.	Gms. C <sub>10</sub> H <sub>8</sub> per 100 Gms. Sat. Solution.
-108	...	...	...	0.62
-82	...	...	...	1.38
-50	...	...	...	2.3
-30	...	8.8	...	6.6
-10	...	15.6	...	14.1
0	1.393	19.5	9.0	19.9
+10	1.355	25.5	14.0	27.5
20	1.300	31.8	20.0	36.3
25	1.280	35.5	23.0	41.0
30	1.255	40.1	26.5	46.0
40	1.205	49.5	35.5	57.2
50	1.150	60.3	47.5	67.6
60	1.090	73.1	62.5	79.2
70	1.040	87.2	80.0	90.3

NOTE. — Speyers' results upon the solubility of C<sub>10</sub>H<sub>8</sub> in CHCl<sub>3</sub>, when calculated to grams per 100 grams of solvent, agree quite well with Etard's (Ann. chim. phys. [7] 2 570, '94 figures, reported on the basis of grams C<sub>10</sub>H<sub>8</sub> per 100 grams saturated solution.

## SOLUBILITY OF NAPHTHALENE IN:

(Schröder; Etard; Speyers.)

t°.	Benzene.	Chlor Benzene.	Hexane.	Toluene.	
	Gms. C <sub>10</sub> H <sub>8</sub> per 100 Gms. Solution.	Gms. C <sub>10</sub> H <sub>8</sub> per 100 Gms. Solution.	Gms. C <sub>10</sub> H <sub>8</sub> per 100 Gms. Solution.	Wt. of 1 cc. Solution.	Gms. C <sub>10</sub> H <sub>8</sub> per 100 Gms. C <sub>6</sub> H <sub>5</sub> .CH <sub>3</sub> .
-50	...	...	0.3	...	...
-20	...	...	1.9	...	...
0	...	...	5.5	0.9124	...
+10	27.5	24.0	9.0	0.9126	15.0
20	36.0	31.0	14.0	0.9135	28.0
25	40.5	35.0	17.5	0.9155	36.0
30	45.5	39.0	21.0	0.9180	42.0
40	54.0	48.0	30.8	0.9250	56.0
50	65.0	57.5	43.7	0.9350	69.5
60	77.5	70.5	60.6	0.9475	83.0
70	88.0	85.0	78.8	0.9640	97.5
80	...	...	...	0.9770	111.0

**β NAPHTHOIC ACID** C<sub>10</sub>H<sub>7</sub>COOH.

One liter of aqueous solution contains 0.058 gram C<sub>10</sub>H<sub>7</sub>COOH at 25°.

(Paul — Z. physik. Ch. 14, 111, '94.)

**β NAPHTHOL**

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**β NAPHTHOL**  $C_{10}H_7OH$ .

100 grams  $H_2O$  dissolve 0.105 gram at  $25^\circ$ , and 1.33 grams at b. pt.;  
100 grams alcohol dissolve 164.0 grams at  $25^\circ$ .

**NARCEINE.**

100 grams pure carbon tetra chloride dissolve 0.011 gram narceine  
at  $17^\circ$ . (Schindelmeiser — Chem.-Ztg. 25, 129, '01.)

**NEODYMIUM CHLORIDE**  $NdCl_3$ .

100 grams  $H_2O$  dissolve 98.7 grams  $NdCl_3$  at  $13^\circ$ , and 140.4 grams at  
 $100^\circ$ . (Matignon — Compt. rend. 133, 289, '01.)

**NEODYMIUM SULPHATE**  $Nd_2(SO_4)_3$ .

## SOLUBILITY IN WATER.

(Muthmann and Rolig — Ber. 31, 1728, '98.)

t°.	Gms. $Nd_2(SO_4)_3$ per 100 Gms.		t°.	Gms. $Nd_2(SO_4)_3$ per 100 Gms.	
	Solution.	Water.		Solution.	Water.
0	8.7	9.5	50	3.5	3.7
16	6.6	7.1	80	2.6	2.7
30	4.7	5.0	108	2.2	2.3

**NICKEL BROMATE**  $Ni(BrO_3)_2 \cdot 6H_2O$ .

100 grams cold water dissolve 27.6 grams nickel bromate.

**NICKEL BROMIDE**  $NiBr_2$ .

## SOLUBILITY IN WATER.

(Etard — Ann. chim. phys. [7] 2, 539, '94.)

t°.	Gms. $NiBr_2$ per 100 Gms. Solution.	t°.	Gms. $NiBr_2$ per 100 Gms. Solution.	t°.	Gms. $NiBr_2$ per 100 Gms. Solution.
-20	47.7	25	57.3	80	60.6
-10	50.5	30	58.0	100	60.8
0	53.0	40	59.1	120	60.9
+10	55.0	50	60.0	140	61.0
20	56.7	60	60.4		

**NICKEL CHLORATE**  $Ni(ClO_3)_2$ .

## SOLUBILITY IN WATER.

(Meusser — Ber. 35, 1419, '02.)

t°.	Gms. $Ni(ClO_3)_2$ per 100 Gms. Solution.	Mols. $Ni(ClO_3)_2$ per 100 Mols. $H_2O$ .	Solid Phase.	t°.	Gms. $Ni(ClO_3)_2$ per 100 Gms. Solution.	Mols. $Ni(ClO_3)_2$ per 100 Mols. $H_2O$ .	Solid Phase.
-18	49.55	7.84	$Ni(ClO_3)_2 \cdot 6H_2O$	48	67.60	16.65	$Ni(ClO_3)_2 \cdot 4H_2O$
-8	51.52	8.49	"	55	68.78	17.59	"
0	52.66	8.88	"	65	69.05	18.01	"
+18	56.74	10.47	"	79.5	75.50	24.68	"
40	64.47	15.35	"	-13.5	31.85	3.73	Ice
				-9	26.62	2.90	"

Sp. Gr. of solution saturated at +18 = 1.661.

**NICKEL CHLORIDE**  $\text{NiCl}_2$ .

## SOLUBILITY IN WATER.

(Etard; at  $12^\circ$ , Ditte — *Compt. rend.* 92, 242, '81.)

$t^\circ$ .	Gms. $\text{NiCl}_2$ per 100 Gms. Solution.	$t^\circ$ .	Gms. $\text{NiCl}_2$ per 100 Gms. Solution.	$t^\circ$ .	Gms. $\text{NiCl}_2$ per 100 Gms. Solution.
-17	29.7	25	40.0	60	45.1
0	35.0	30	40.8	70	46.0
+10	37.3	40	42.3	78	46.6
20	39.1	50	43.9	100	46.7

1000 cc. sat.  $\text{HCl}$  solution dissolve 4.0 grams  $\text{NiCl}_2$  at  $12^\circ$ .100 grams abs. alcohol dissolve 53.71 grams  $\text{NiCl}_2 \cdot 6\text{H}_2\text{O}$  at room temperature.100 grams abs. alcohol dissolve 10.05 grams  $\text{NiCl}_2$  at room temperature.(Böttker — *Z. physik. Chem.* 22, 511, '97.)100 grams abs. alcohol dissolve 2.16 grams  $\text{NiCl}_2 \cdot 7\text{H}_2\text{O}$  at  $17^\circ$ , and 1.4 grams at  $3^\circ$ .(de Bruyn — *Rec. trav. chim.* 11, 156, '92.)100 grams saturated solution in glycol contain 16.2 grams  $\text{NiCl}_2$  at room temperature.(de Coninck — *Bul. acad. roy. Belgique*, 359, '05.)**NICKEL IODATE**  $\text{Ni(IO}_3)_2$ .

## SOLUBILITY IN WATER.

(Meusser — *Ber.* 34, 2440, '01.)

$t^\circ$ .	Gms. $\text{Ni(IO}_3)_2$ per 100 Gms. Solution.	Mols. $\text{Ni(IO}_3)_2$ per 100 Mols. $\text{H}_2\text{O}$ .	Solid Phase.	$t^\circ$ .	Gms. $\text{Ni(IO}_3)_2$ per 100 Gms. Solution.	Mols. $\text{Ni(IO}_3)_2$ per 100 Mols. $\text{H}_2\text{O}$ .	Solid Phase.
0	0.73	0.033	$\text{Ni(IO}_3)_2 \cdot 4\text{H}_2\text{O}$	18	0.55	0.0245	$\text{Ni(IO}_3)_2 \cdot 2\text{H}_2\text{O}$ (2)
18	1.01	0.045	"	50	0.81	0.035	"
30	1.41	0.063	"	75	1.03	0.045	"
0	0.53	0.023	$\text{Ni(IO}_3)_2 \cdot 2\text{H}_2\text{O}$ (1)	80	1.12	0.049	"
18	0.68	0.030	"	30	1.135	0.050	$\text{Ni(IO}_3)_2$
30	0.86	0.039	"	50	1.07	0.046	"
50	1.78	0.080	"	75	1.02	0.045	"
8	0.52	0.023	$\text{Ni(IO}_3)_2 \cdot 2\text{H}_2\text{O}$ (2)	90	0.988	0.044	"

(1)  $\alpha$  Dihydrate.(2)  $\beta$  Dihydrate.**NICKEL IODIDE**  $\text{NiI}_2$ .

## SOLUBILITY IN WATER.

(Etard — *Ann. chim. phys.* [7] 2, 546, '94.)

$t^\circ$ .	Gms. $\text{NiI}_2$ per 100 Gms. Solution.	$t^\circ$ .	Gms. $\text{NiI}_2$ per 100 Gms. Solution.	$t^\circ$ .	Gms. $\text{NiI}_2$ per 100 Gms. Solution.
-20	52.0	25	60.7	60	64.8
0	55.4	30	61.7	70	65.0
10	57.5	40	63.5	80	65.2
20	59.7	50	64.7	90	65.3

# NICKEL NITRATE

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## NICKEL NITRATE $\text{Ni}(\text{NO}_3)_2$ .

### SOLUBILITY IN WATER.

(Funk — Wiss. Abh. p. t. Reichanstalt, 3, 439, '00.)

t°.	Gms. $\text{Ni}(\text{NO}_3)_2$ per 100 Gms. Solution.	Mols. $\text{Ni}(\text{NO}_3)_2$ per 100 Mols. $\text{H}_2\text{O}$ .	Solid Phase.	t°.	Gms. $\text{Ni}(\text{NO}_3)_2$ per 100 Gms. Solution.	Mols. $\text{Ni}(\text{NO}_3)_2$ per 100 Mols. $\text{H}_2\text{O}$ .	Solid Phase.
-23	39.02	6.31	$\text{Ni}(\text{NO}_3)_2 \cdot 9\text{H}_2\text{O}$	20	49.06	9.49	$\text{Ni}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$
-21	39.48	6.43	"	41	55.22	12.1	"
-10.5	44.13	7.79	"	56.7	62.76	16.7	"
-21	39.94	6.55	$\text{Ni}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$	58	61.61	15.9	$\text{Ni}(\text{NO}_3)_2 \cdot 3\text{H}_2\text{O}$
-12.5	41.59	7.01	"	60	61.99	16.0	"
-10	42.11	7.16	"	64	62.76	16.6	"
-6	43.00	7.44	"	70	63.95	17.6	"
0	44.32	7.86	"	90	70.16	23.1	"
+18	48.59	9.3	"	95	77.12	33.3	"

100 grams sat. solution in glycol contain 7.5 grams  $\text{Ni}(\text{NO}_3)_2$  at room temperature. (de Coninck.)

## NICKEL SULPHATE $\text{NiSO}_4$ .

### SOLUBILITY IN WATER.

(Steele and Johnson — J. Ch. Soc. 85, 116, '04; see also Etard and Mulder.)

t°.	Grams $\text{NiSO}_4$ per 100 Gms.		Solid Phase.	t°.	Grams $\text{NiSO}_4$ per 100 Gms.		Solid Phase.
	Solution.	Water.			Solution.	Water.	
5	20.47	25.74	$\text{NiSO}_4 \cdot 7\text{H}_2\text{O}$	33.0	30.25	43.35	$\text{NiSO}_4 \cdot 6\text{H}_2\text{O}$
0	21.40	27.22	"	35.6	30.45	43.79	" (blue)
9	23.99	31.55	"	44.7	32.45	48.05	"
22.6	27.48	37.90	"	50.0	33.39	50.15	"
30	29.99	42.46	"	53.0	34.38	52.34	"
32.3	30.57	44.02	"	54.5	34.43	52.50	$\text{NiSO}_4 \cdot 6\text{H}_2\text{O}$
33	31.38	45.74	"	57.0	34.81	53.40	" (green)
34	31.20	45.5	"	60	35.43	54.80	"
32.3	30.35	43.57	$\text{NiSO}_4 \cdot 6\text{H}_2\text{O}$	70	37.29	59.44	"
33.0	30.25	43.35	" (blue)	80	38.71	63.17	"
34.0	30.49	43.83	"	99	43.42	76.71	"

Transition points, hepta hydrate  $\rightleftharpoons$  hexa hydrate =  $31.5^\circ$ .  
Hexa hydrate (blue)  $\rightleftharpoons$  hexa hydrate (green) =  $53.3^\circ$ .

## SOLUBILITY OF MIXTURES OF NICKEL SULPHATE AND COPPER SULPHATE.

(Fock — Z. Kryst. Min. 28, 387, '97.)

## Results at 35°.

Gms. per 100 Gms. H <sub>2</sub> O.		Mol. per cent in Solution.		Mol. per cent in Solid Phase.		Crystal Form.
CuSO <sub>4</sub> .	NiSO <sub>4</sub> .	CuSO <sub>4</sub> .	NiSO <sub>4</sub> .	CuSO <sub>4</sub> .	NiSO <sub>4</sub> .	
9.62	583.9	1.57	98.43	0.35	99.65	Rhombic
41.66	484.4	7.69	92.31	2.12	97.88	"
75.39	553.5	11.66	88.34	4.77	95.23	Tetragonal
106.40	506.5	16.92	83.08	6.52	93.48	"
172.0	483.8	25.63	74.37	13.88	86.17	"
186.9	468.0	27.90	72.10	18.77	81.23	Tetragonal
				94.91	5.09	Triclinic

## Results at 67°.

20.04	729.3	2.65	97.35	0.93	99.07	Monoclinic
66.01	706.2	8.31	91.69	2.86	97.14	"
88.08	501.6	13.55	86.45	3.92	96.08	"
47.94	675.0	16.39	83.61	6.66	93.34	"
249.9	747.8	24.46	75.54	22.32	77.68	{ Monoclinic Triclinic

## SOLUBILITY OF MIXTURES OF NICKEL SULPHATE AND SODIUM SULPHATE, ETC.

(Koppel; Wetzal — Z. physik. Chem. 52, 401, '05.)

t°.	Gms. per 100 Gms. Solution.		Gms. per 100 Gms. H <sub>2</sub> O.		Mols. per 100 Mols. H <sub>2</sub> O.		Solid Phase.
	NiSO <sub>4</sub> .	Na <sub>2</sub> SO <sub>4</sub> .	NiSO <sub>4</sub> .	Na <sub>2</sub> SO <sub>4</sub> .	NiSO <sub>4</sub> .	Na <sub>2</sub> SO <sub>4</sub> .	
0	16.94	7.61	22.46	10.09	2.61	1.28	NiSO <sub>4</sub> ·7H <sub>2</sub> O + Na <sub>2</sub> SO <sub>4</sub> ·10H <sub>2</sub> O
5	17.99	10.85	25.28	15.24	2.94	1.93	
10	18.97	13.85	28.26	20.64	3.29	2.61	
20	18.76	17.21	29.31	26.87	3.410	3.404	NiNa <sub>2</sub> (SO <sub>4</sub> ) <sub>2</sub> ·4H <sub>2</sub> O
25	17.85	16.54	27.33	25.33	3.181	3.208	"
30	16.74	15.34	24.64	22.58	2.868	2.861	"
35	16.28	14.91	23.66	21.67	2.753	2.744	"
40	15.35	14.49	21.88	20.65	2.546	2.616	"
18.5	19.61	16.49	30.70	25.80	3.56	3.27	NiNa <sub>2</sub> (SO <sub>4</sub> ) <sub>2</sub> ·4H <sub>2</sub> O + NiSO <sub>4</sub> ·7H <sub>2</sub> O
20	20.13	16.15	31.59	25.35	3.67	3.21	
25	21.20	14.77	33.11	23.06	3.85	2.92	
30	22.60	12.80	34.98	19.82	4.07	2.59	
35	23.62	10.78	36.01	16.43	4.19	2.08	NiNa <sub>2</sub> (SO <sub>4</sub> ) <sub>2</sub> ·4H <sub>2</sub> O + Na <sub>2</sub> SO <sub>4</sub> ·10H <sub>2</sub> O
40	24.92	9.39	37.93	14.29	4.41	1.81	
18.5	16.80	18.93	26.14	29.45	3.04	3.72	
20	15.48	20.18	24.06	31.37	2.80	3.97	
25	10.92	24.12	16.81	37.13	1.96	4.70	NiNa <sub>2</sub> (SO <sub>4</sub> ) <sub>2</sub> ·4H <sub>2</sub> O + Na <sub>2</sub> SO <sub>4</sub>
30	6.40	28.71	9.87	44.25	1.15	5.60	
35	4.54	31.65	7.13	49.59	0.838	6.28	
40	4.63	31.37	7.24	49.03	0.843	6.21	

## NICKEL SULPHATE

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### SOLUBILITY OF NICKEL POTASSIUM SULPHATE $\text{NiK}_2(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$ IN WATER.

(Tobler — Liebig's Ann. 95, 193, '55; v. Hauer — J. pr. Ch. 74, 433, '58.)

t°.	Grams $\text{NiK}_2(\text{SO}_4)_2$ per 100 Gms. $\text{H}_2\text{O}$ .		t°.	Grams $\text{NiK}_2(\text{SO}_4)_2$ per 100 Gms. $\text{H}_2\text{O}$ .	
	(Tobler.)	(v. Hauer.)		(Tobler.)	(v. Hauer.)
0	5.3	...	50	30	...
10	8.9	...	60	35.4	20.47
20	13.8	9.53	70	42.0	...
30	18.6	...	80	46.0	28.2
40	24.0	14.03			

### SOLUBILITY OF NICKEL SULPHATE IN METHYL AND ETHYL ALCOHOLS.

(de Bruyn — Z. physik. Ch. 10, 783, '92.)

100 grams abs. ethyl alcohol dissolve 1.3 grams  $\text{NiSO}_4 \cdot 7\text{H}_2\text{O}$  at 17°.  
 100 grams abs. methyl alcohol dissolve 46.0 grams  $\text{NiSO}_4 \cdot 7\text{H}_2\text{O}$  at 17°, and 24.7 grams at 4°.  
 100 grams abs. methyl alcohol dissolve 0.5 gram  $\text{NiSO}_4$  at 18°.  
 100 grams abs. methyl alcohol dissolve 31.6 grams  $\text{NiSO}_4 \cdot 6\text{H}_2\text{O}$  at 17°.  
 100 grams 93.5% methyl alcohol dissolve 10.1 grams  $\text{NiSO}_4 \cdot 7\text{H}_2\text{O}$  at 4°, and 7.8 grams  $\text{NiSO}_4 \cdot 6\text{H}_2\text{O}$  at 18°.  
 100 grams 50.0% methyl alcohol dissolve 2.0 grams  $\text{NiSO}_4 \cdot 7\text{H}_2\text{O}$  at 4°, and 1.9 grams  $\text{NiSO}_4 \cdot 6\text{H}_2\text{O}$  at 18°.

100 grams sat. solution in glycol contain 9.7 grams  $\text{NiSO}_4$  at room temperature.

(de Coninck — Bull. acad. roy. Belgique 359, '05.)

## NICOTINE $\text{C}_{10}\text{H}_{14}\text{N}_2$ .

### SOLUBILITY IN WATER.

(Hudson — Z. physik. Chem. 47, 114, '04.)

Determinations made by Synthetic Method, for which see Note, page 9. Below 60° and above 210° both liquids are miscible in all proportions; likewise with percentages of nicotine less than 6.8 and above 82 per cent the liquid does not show two layers at any temperature. Below 94° the upper layer is water. Above 94° the upper layer is nicotine. The curve plotted from the following results makes a complete circle.

Percentage of Nicotine in the Mixture.	Temp. of Appearance of Two Layers. Degrees C.	Temperature of Homogeneity. Degrees C.
6.8	94	95
7.8	89	155
10.0	75	...
14.8	65	200
32.2	61	210
49.0	64	205
66.8	72	190
80.2	87	170
82.0	129	130

## NITROGEN N.

## SOLUBILITY IN WATER.

(Winkler — Ber. 24, 3606, '91; Braun — Z. physik. Chem. 33, 732, '00; Bohr and Bock — Wied. Ann. 44, 318, '91.)

t°.	"Coefficient of Absorption" $\beta$ .			"Solubility" B'.	g.
0	0.0235*	0.0239†	... ‡	0.0233*	0.00239*
5	0.0208	0.0215	0.0217	0.0206	0.00259
10	0.0186	0.0196	0.0200	0.0183	0.00230
15	0.0168	0.0179	0.0179	0.0165	0.00208
20	0.0154	0.0164	0.0162	0.0151	0.00189
25	0.0143	0.0150	0.0143	0.0139	0.00174
30	0.0134	0.0138	...	0.0128	0.00161
35	0.0125	0.0127	...	0.0118	0.00148
40	0.0118	0.0118	...	0.0110	0.00139
50	0.0109	0.0106	...	0.0096	0.00121
60	0.0102	0.0100	...	0.0082	0.00105
80	0.0096	...	...	0.0051	0.00069
100	0.0095	0.0100	...	0.0000	0.00000

\* W.

† B. and B.

‡ B.

For values of  $\beta$ ,  $\beta'$ , and  $g$ , see Ethane, page 133.

## SOLUBILITY OF NITROGEN IN AQUEOUS SALT SOLUTIONS.

(Braun.)

t°.	Coefficient of Absorption of N in Barium Chloride Solutions of:				
	13.83 per cent.	11.02 per cent.	6.90 per cent.	3.87 per cent.	3.33 per cent.
5	0.0127	0.0137	0.0160	0.0180	0.0183
10	0.0117	0.0125	0.0147	0.0166	0.0168
15	0.0104	0.0114	0.0132	0.0148	0.0150
20	0.0092	0.0098	0.0118	0.0132	0.0135
25	0.0078	0.0086	0.0104	0.0114	0.0119

t°.	Coefficient of Absorption of N in Sodium Chloride Solutions of:				
	11.73 per cent.	8.14 per cent.	6.4 per cent.	2.12 per cent.	0.67 per cent.
5	0.0102	0.0127	0.0138	0.0179	0.0200
10	0.0093	0.0113	0.0126	0.0164	0.0185
15	0.0081	0.0101	0.0113	0.0147	0.0164
20	0.0066	0.0087	0.0098	0.0131	0.0148
25	0.0047	0.0075	0.0083	0.0113	0.0130

## SOLUBILITY OF NITROGEN IN ALCOHOL.

(Bunsen.)

t°	0°	5°	10°	15°	20°	24°
Vols. N * dissolved by 1 Vol. Alcohol.	0.1263	0.1244	0.1228	0.1214	0.1204	0.1198

\* At 0° and 760 mm.



## NITROGEN

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### SOLUBILITY OF NITROGEN IN MIXTURES OF ALCOHOL AND WATER AT 25°.

(Just — Z. physik. Ch. 37, 361, '01.)

Results in terms of the Ostwald solubility expression, see page 105.

Vol. H <sub>2</sub> O in Mixture.	Vol. Alcohol in Mixture.	Dissolved N ( <i>l</i> <sub>25</sub> ).
100	0	0.01634
80	20	0.01536
67	33	0.01719
0	100 (99.8% Alcohol)	0.1432

### SOLUBILITY OF NITROGEN IN SEVERAL SOLVENTS AT 20° AND 25°.

(Just.)

Solvent.	<i>l</i> <sub>25</sub> .	<i>l</i> <sub>20</sub> .	Solvent.	<i>l</i> <sub>25</sub> .	<i>l</i> <sub>20</sub> .
Water	0.01634	0.01705	Toluene	0.1235	0.1186
Aniline	0.03074	0.02992	Chloroform	0.1348	0.1282
Sulphur Dioxide	0.05860	0.05290	Methyl Alcohol	0.1415	0.1348
Nitro Benzene	0.06255	0.06082	Ethyl Alcohol (99.8%)	0.1432	0.1400
Benzene	0.1159	0.1114	Acetone	0.1460	0.1383
Acetic Acid	0.1190	0.1172	Amyl Acetate	0.1542	0.1512
Xylene	0.1217	0.1185	Ethyl Acetate	0.1727	0.1678
Amyl Alcohol	0.1225	0.1208	Iso Butyl Acetate	0.1734	0.1701

### SOLUBILITY OF NITROGEN IN PETROLEUM. COEFFICIENT OF ABSORPTION AT 10° = 0.135, AT 20° = 0.117.

(Gniewasz and Walfisz — Z. physik. Ch. 1, 70, '87.)

### SOLUBILITY OF NITROGEN IN AQUEOUS PROPIONIC ACID AND UREA SOLUTIONS.

(Braun.)

t°.	Coefficient of Absorption of N in C <sub>2</sub> H <sub>5</sub> COOH Solutions of:				
	11.22 per cent.	9.54 per cent.	6.07 per cent.	4.08 per cent.	3.82 per cent.
5	0.0195	0.0204	0.0208	0.0210	0.0209
10	0.0178	0.0182	0.0186	0.0192	0.0191
15	0.0159	0.0163	0.0164	0.0169	0.0167
20	0.0146	0.0147	0.0148	0.0154	0.0155
25	0.0130	0.0134	0.0134	0.0137	0.0137

t°.	Coefficient of Absorption of N in CO(NH <sub>2</sub> ) <sub>2</sub> Solutions of:					
	15.65 per cent.	11.9 per cent.	9.42 per cent.	6.90 per cent.	5.15 per cent.	2.28 per cent.
5	0.0175	0.0179	0.0190	0.0198	0.0197	0.0199
10	0.0162	0.0167	0.0176	0.0183	0.0182	0.0184
15	0.0150	0.0149	0.0158	0.0165	0.0165	0.0171
20	0.0140	0.0139	0.0146	0.0151	0.0151	0.0155
25	0.0130	0.0130	0.0133	0.0137	0.0135	0.0139

NITROUS OXIDE  $N_2O$ .

## SOLUBILITY IN WATER.

(Bunsen; Gordon — Z. physik. Ch. 18, 9, '95; Roth — *Ibid.* 24, 123, '97; Knopp — *Ibid.* 48, 106, '04  
Geffcken — *Ibid.* 49, 276, '04.)

t°.	Coefficient of Absorption $\beta$ .				$q$	Solubility in terms of Ostwald Expression (l).*		
	(B.)	(G.)	(R.)	(K.)		(R.)	(K.)	(G.)
5	1.0950	1.0955	1.1403	...	0.205	1.161	...	1.067
10	0.9196	0.9200	0.9479	...	0.171	0.9815	...	0.9101
15	0.7778	0.7787	0.7896	...	0.143	0.8315	...	0.7784
20	0.6700	0.6700	0.6654	0.6270	0.121	0.7131	0.6739	0.6756
25	0.5961	...	0.5752	...	0.104	0.6281	...	0.5992

\* Calculated by Geffcken.

NOTE. — Knopp and also Geffcken call attention to the fact that Roth in making his determinations used a rubber tube between the gas burette and the shaking flask, and give this as an explanation of the high results which he obtained.

## SOLUBILITY OF NITROUS OXIDE IN AQUEOUS SULPHURIC ACID.

(Lunge — Ber. 14, 2188, '81; see also Geffcken's results.)

Sp. Gr. of $H_2SO_4$	1.84	1.80	1.705	1.45	1.25
Vols. $N_2O$ dissolved by 100 vols. $H_2SO_4$	75.7	66.0	39.1	41.6	33.0

100 vols. of KOH solution of 1.12 Sp. Gr. absorb 18.7 vols.  $N_2O$ .

100 vols. of NaOH solution of 1.10 Sp. Gr. absorb 23.1 vols.  $N_2O$ .

## SOLUBILITY OF NITROUS OXIDE IN AQUEOUS SOLUTIONS OF ACIDS.

(Geffcken.)

Results in terms of the Ostwald Solubility Expression (l). See p. 105.

In Hydrochloric Acid. In Nitric Acid. In Sulphuric Acid.

Gms. HCl per Liter.	$N_2O$ Dissolved		Gms. $HNO_3$ per Liter.	$N_2O$ Dissolved		Gms. $H_2SO_4$ per Liter.	$N_2O$ Dissolved	
	$l_{15}$ .	$l_{25}$ .		$l_{15}$ .	$l_{25}$ .		$l_{15}$ .	$l_{25}$ .
18.22	0.755	0.577	36.52	0.777	0.597	24.52	0.734	0.566
36.45	0.738	0.568	63.05	0.777	0.602	49.04	0.699	0.543
72.90	0.716	0.557	126.10	0.775	0.611	98.08	0.645	0.509
						147.12	0.602	0.482
						196.16	0.562	0.463

## SOLUBILITY OF NITROUS OXIDE IN AQUEOUS SOLUTIONS OF:

(Roth.)

## Phosphoric Acid.

## Oxalic Acid.

t°.	Coefficient of Abs. in $H_3PO_4$ Solutions of:					Coefficient of Abs. in ( $COOH$ ) <sub>2</sub> Solutions of:	
	3.38%.	4.72%.	8.84%.	9.89%.	13.35%.	0.812%.	3.70%.
5	1.057	1.0365	0.9883	0.9635	0.9171	1.1450	1.1094
10	0.8827	0.8665	0.8296	0.8101	0.7711	0.9526	0.9264
15	0.7388	0.7258	0.6977	0.6826	0.6505	0.7940	0.7745
20	0.6253	0.6147	0.5926	0.5810	0.5555	0.6694	0.6538
25	0.5427	0.5329	0.5143	0.5054	0.4860	0.5784	0.5643

# NITROUS OXIDE

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## SOLUBILITY OF NITROUS OXIDE IN AQUEOUS SOLUTIONS OF PROPIONIC ACID AT 20°. (Knopp.)

Gms. C <sub>2</sub> H <sub>5</sub> COOH per liter	15.15	60.42	158.4	176.6	344.0
Coef. of Absorp- tion of N <sub>2</sub> O	0.6323	0.6369	0.6504	0.6534	0.7219

## SOLUBILITY OF NITROUS OXIDE IN AQUEOUS SALT SOLUTIONS.

Results by Geffcken in terms of the Ostwald expression (l). See page 105.

Salt.	Formula.	Conc. of Salt per Liter.		Solubility of N <sub>2</sub> O.	
		Gram Equiv.	Grams.	<i>l</i> <sub>18</sub> .	<i>l</i> <sub>25</sub> .
Ammonium Chloride	NH <sub>4</sub> Cl	0.5	26.76	0.730	0.557
Ammonium Chloride	NH <sub>4</sub> Cl	1.0	53.52	0.691	0.529
Caesium Chloride	CsCl	0.5	84.17	0.710	0.544
Lithium Chloride	LiCl	0.5	21.24	0.697	0.535
Lithium Chloride	LiCl	1.0	42.48	0.623	0.483
Potassium Bromide	KBr	0.5	59.55	0.697	0.536
Potassium Bromide	KBr	1.0	119.11	0.627	0.485
Potassium Chloride	KCl	0.5	37.3	0.686	0.527
Potassium Chloride	KCl	1.0	74.6	0.616	0.475
Potassium Iodide	KI	0.5	83.06	0.702	0.541
Potassium Iodide	KI	1.0	166.12	0.633	0.492
Potassium Hydroxide	KOH	0.5	28.08	0.668	0.514
Potassium Hydroxide	KOH	1.0	56.16	0.559	0.436
Rubidium Chloride	RbCl	0.5	60.47	0.695	0.533
Rubidium Chloride	RbCl	1.0	120.95	0.625	0.483

Results by Knopp, in terms of the coefficient of absorption. See page 105.

Salt.	Formula.	Conc. of Salt per Liter.		Coef. of Absorption of N <sub>2</sub> O at 20°.
		Normality.	Grams.	
Potassium Nitrate	KNO <sub>3</sub>	0.1061	10.74	0.6173
"	"	0.2764	27.94	0.6002
"	"	0.5630	56.97	0.5713
"	"	1.1683	118.2	0.5196
Sodium Nitrate	NaNO <sub>3</sub>	0.1336	11.37	0.6089
"	"	0.3052	25.97	0.5876
"	"	0.6286	53.50	0.5465
"	"	1.1200	95.30	0.4926

Results by Roth, in terms of the coefficient of absorption.

Grams NaCl per 100 Grams Solution.	Coefficient of Absorption of N <sub>2</sub> O at:				
	5°.	10°.	15°.	20°.	25°.
0.99	1.0609	0.8812	0.7339	0.6191	0.5363
1.808	1.0032	0.8383	0.7026	0.5962	0.5190
3.886	0.9131	0.7699	0.6495	0.5520	0.4475
5.865	0.8428	0.7090	0.5976	0.5088	0.4224

## SOLUBILITY OF NITROUS OXIDE IN AQUEOUS SALT SOLUTIONS.

Results by Gordon in terms of coefficient of absorption. See p. 105.

Salt.	Concentration of Salt.		Coefficient of Absorption of $N_2O$ at:			
	Grams per 100 Grams Solution.	Gram Mols. per Liter.	5°.	10°.	15°.	20°
Calcium Chloride	5.79	0.547	0.819	0.697	0.591	0.500
"	9.86	0.964	0.668	0.586	0.509	0.435
"	13.99	1.416	0.510	0.441	0.380	0.328
Lithium Chloride	1.35	0.319	0.986	0.831	0.700	0.594
"	3.85	0.928	0.878	0.743	0.629	0.536
"	11.48	2.883	0.606	0.512	0.437	0.382
Lithium Sulphate	2.37	0.219	0.934	0.792	0.670	0.569
"	5.46	0.521	0.795	0.665	0.557	0.474
"	8.56	0.836	0.646	0.555	0.477	0.415
Magnesium Sulphate	5.90	0.521	0.766	0.664	0.561	0.471
"	7.66	0.687	0.708	0.586	0.488	0.414
"	10.78	0.997	0.569	0.491	0.417	0.346
Potassium Chloride	4.90	0.676	0.879	0.751	0.643	0.555
"	7.64	1.037	0.799	0.693	0.591	0.494
"	14.58	2.147	0.654	0.574	0.500	0.430
"	22.08	3.414	0.544	0.459	0.390	0.339
Potassium Sulphate	2.62	0.154	0.986	0.831	0.701	0.605
"	4.78	0.285	0.918	0.763	0.637	0.542
Sodium Chloride	6.20	1.107	0.800	0.682	0.585	0.509
"	8.88	1.614	0.713	0.603	0.510	0.434
"	12.78	2.391	0.634	0.532	0.449	0.386
Sodium Sulphate	5.76	0.427	0.808	0.677	0.584	0.495
"	8.53	0.646	0.692	0.574	0.482	0.416
"	12.44	0.974	0.559	0.486	0.417	0.354
Strontium Chloride	3.31	0.215	0.928	0.788	0.671	0.578
"	5.73	0.380	0.848	0.709	0.610	0.550
"	13.24	0.939	0.644	0.547	0.463	0.390

## SOLUBILITY OF NITROUS OXIDE IN ALCOHOL AND IN AQUEOUS CHLORAL HYDRATE SOLUTIONS AT 20°.

(Bunsen; Knopp—Z. physik. Ch. 48, 106, '04.)

t°.	In Alcohol (B.).		In Aq. Chloral Hydrate (K.).	
	Vols. $N_2O$ (at 0° and 760 mm.) per 1 Vol. Alcohol.	Normality of $C_2HCl_3O.H_2O$ .	Gms. $C_2HCl_3O.H_2O$ per Liter.	Coef. of Abs. of $N_2O$ .
0	4.178	0.184	30.43	0.618
5	3.844	0.445	73.60	0.613
10	3.541	0.942	155.8	0.596
15	3.268	1.165	192.7	0.589
20	3.025	1.474	243.8	0.579
24	2.853	1.911	316.4	0.567

## SOLUBILITY OF NITROUS OXIDE IN PETROLEUM. COEFFICIENT OF ABSORPTION AT 10° = 2.49, AT 20° = 2.11.

(Gniewass and Walfisz—Z. physik. Ch. 2, 70, '87.)

# NITROUS OXIDE

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## SOLUBILITY OF NITROUS OXIDE IN AQUEOUS SOLUTIONS OF GLYCERINE AND OF UREA.

(Roth.)

t°.	Coefficient of Absorption of N <sub>2</sub> O in Glycerine Solutions of:			
	3.46 per cent.	6.73 per cent.	12.12 per cent.	16.24 per cent.
5	1.097	1.055	0.999	0.959
10	0.917	0.887	0.841	0.810
15	0.767	0.745	0.710	0.686
20	0.647	0.630	0.605	0.585
25	0.556	0.542	0.527	0.508

t°.	Coefficient of Absorption of N <sub>2</sub> O in Urea Solutions of:				
	3.31 per cent.	4.97 per cent.	6.37 per cent.	7.30 per cent.	9.97 per cent.
5	1.104	1.096	1.088	1.101	1.069
10	0.921	0.920	0.909	0.921	0.901
15	0.771	0.773	0.761	0.772	0.761
20	0.653	0.656	0.644	0.655	0.651
25	0.569	0.567	0.559	0.570	0.569

# NITRIC OXIDE NO.

## SOLUBILITY IN WATER.

(Winkler — Ber. 34, 1474, '01.)

t°.	β.	β'.	q.	t°.	β.	β'.	q.
0	0.0738	0.0734	0.00984	40	0.0351	0.0325	0.00440
5	0.0646	0.0641	0.00860	50	0.0315	0.0277	0.00376
10	0.0571	0.0564	0.00757	60	0.0295	0.0237	0.00324
15	0.0515	0.0506	0.00680	70	0.0281	0.0195	0.00267
20	0.0471	0.0460	0.00618	80	0.0270	0.0144	0.00199
25	0.0430	0.0419	0.00564	90	0.0265	0.0082	0.00114
30	0.0400	0.0384	0.00517	100	0.0263	0.0000	0.00000

For values of β, β' and q, see Ethane, page 133.

## SOLUBILITY OF NITRIC OXIDE IN AQUEOUS SULPHURIC ACID SOLUTIONS AT 18°.

(Lunge — Ber. 18, 1391, '85; Tower — Z. anorg. Ch. 50, 382, '06.)

Wt. per cent H <sub>2</sub> SO <sub>4</sub> in Solution.	Sp. Gr. at 15°.	Tension of H <sub>2</sub> O Vapor.	Solubility Coefficient * of NO at 18°.
98	1.84	...	0.0227 (0.035, L.)
90	1.82	0.1 mm.	0.0193
80	1.733	0.4 "	0.0117
70	1.616	1.5 "	0.0113
60	1.503	3.1 "	0.0118 (0.017, L.)
50	1.399	6.2 "	0.0120

\* Volume of NO (at 760 mm.) per 1 volume of aqueous H<sub>2</sub>SO<sub>4</sub>.

## SOLUBILITY OF NITRIC OXIDE IN ALCOHOL.

(Bunsen.)

t°	0°	5°	10°	15°	20°	24°
Vols. NO* absorbed by 1 vol. Alc.	0.316	0.300	0.286	0.275	0.266	0.261

\* At 0° and 760 mm.

OXALIC ACID  $(\text{COOH})_2 \cdot 2\text{H}_2\text{O}$ .

## SOLUBILITY IN WATER.

(Average curve from results of Alluard; Miczynski — *Monatsh. Ch.* 7, 258, '86; Henry — *Compt. rend.* 99, 1157, '84; Lamouroux — *Ibid.* 128, 998, '99; at 25°, Foote and Andrew — *Am. Ch. J.* 34, 154, '05.)

t°.	Grams $(\text{COOH})_2$ per 100 Grams		t°.	Grams $(\text{COOH})_2$ per 100 Grams	
	H <sub>2</sub> O.	Solution.		H <sub>2</sub> O.	Solution.
0	3.45	3.33	40	21.15	17.46
10	5.55	5.26	50	31.53	23.97
20	8.78	8.07	60	45.55	31.37
25	11.36	10.21	70	63.82	38.95
30	13.77	11.91			

## SOLUBILITY OF OXALIC ACID IN ALCOHOLS.

(Timofeev — *Compt. rend.* 112, 1137, '91; Bourgoin — *Ann. chim. phys.* [5] 13, 406, '78.)

t°.	Grams $(\text{COOH})_2$ per 100 Grams of:		
	Methyl Alcohol.	Ethyl Alcohol.	Propyl Alcohol.
- 1	36.26	20.25	9.73
+ 20	47.24	26.23	15.14

## SOLUBILITY OF OXALIC ACID IN ABSOLUTE AND IN AQ. ETHER AT 25°.

(Böttker — *Z. physik. Ch.* 22, 512, '97; Bourgoin.)

100 grams absolute ether dissolve 1.47 grams  $(\text{COOH})_2 \cdot 2\text{H}_2\text{O}$ .

100 grams absolute ether dissolve 23.59 grams  $(\text{COOH})_2$ .

## In Aqueous Ether Solutions.

Gms. Solid Acid Added per 100 cc. Ether Solution.		Grams per 100 cc. Ether Solution.	
$(\text{COOH})_2 \cdot 2\text{H}_2\text{O}$ .	$(\text{COOH})_2$ .	H <sub>2</sub> O.	$(\text{COOH})_2$ .
(1) 5.0	0.0	1.250	0.742
(2) 5.0	0.0	0.788	0.720
5.0	0.0	0.418	1.044
5.0	2.44	0.360	3.388
5.0	4.82	0.484	6.038
5.0	7.14	0.558	8.538
5.0	9.42	0.632	10.996
5.0	11.63	0.676	13.316
5.0	13.79	0.761	15.684
5.0	18.18	0.816	17.818
5.0	22.73	0.816	17.818

(1) Ether saturated with water. (2) Ether containing 0.694 per cent water.

100 grams glycerine dissolve 15 grams oxalic acid at 15.5°.

## DISTRIBUTION OF OXALIC ACID BETWEEN WATER AND AMYL ALCOHOL AT 20°.

(Herz and Fischer — *Ber.* 37, 4748, '04.)

Millimols $\frac{1}{2}(\text{COOH})_2$ per 10 cc.		Grams $(\text{COOH})_2$ per 100 cc.	
Aq. Layer.	Alcoholic Layer.	Aq. Layer.	Alcoholic Layer.
0.6866	0.1451	0.306	0.0653
2.364	0.7233	1.064	0.320
6.699	2.550	3.015	1.148
10.029	4.300	4.511	1.934

# OXYGEN

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## OXYGEN O. SOLUBILITY IN WATER.

(Winkler — Ber. 24, 3609, '91; Bohr and Bock — Wied. Ann. [2] 44, 318, '91.)

t°.	Coef. of Absorption $\beta$ .		g.	cc. O per Liter H <sub>2</sub> O.	t°.	Coef. of Absorption $\beta$ .		g.
0	0.0489*	0.0496†	0.00695	10.187	40	0.0231*	0.0233†	0.00308
5	0.0429	0.0439	0.00607	8.907	50	0.0209	0.0207	0.00266
10	0.0380	0.0390	0.00537	7.873	60	0.0195	0.0189	0.00227
15	0.0342	0.0350	0.00480	7.038	70	0.0183	0.0178	0.00186
20	0.0310	0.0317	0.00434	6.356	80	0.0176	0.0172	0.00138
25	0.0283	0.0290	0.00393	5.776	90	0.0172	0.0169	0.00079
30	0.0261	0.0268	0.00359	5.255	100	0.0170	0.0168	0.00000

\* W.

† B. and B.

For values of  $\beta$  and  $q$  see Ethane, page 133.

## SOLUBILITY OF THE OXYGEN OF AIR IN WATER.

t°.	5.2°	5.65°	14.78°	24.8°
Solubility *	8.856	8.744	7.08	5.762

\* cc. Oxygen per 1000 cc. H<sub>2</sub>O saturated with air at 760 mm.

## SOLUBILITY OF OXYGEN IN WATER AND IN AQUEOUS SOLUTIONS OF ACIDS, BASES AND SALTS.

(Geffcken — Z. physik. Ch. 49, 269, '04.)

Aq. Solution of:	Concentration per Liter.		Solubility of Oxygen.*	
	Gram Equiv.	Grams.	15°.	18°.
Water alone	...	...	0.0363	0.0308
Hydrochloric Acid	0.5	18.22	0.0344	0.0296
"	1.0	36.45	0.0327	0.0287
"	2.0	72.90	0.0299	0.0267
Nitric Acid	0.5	36.52	0.0348	0.0302
"	1.0	63.05	0.0336	0.0295
"	2.0	126.10	0.0315	0.0284
Sulphuric Acid	0.5	24.52	0.0338	0.0288
"	1.0	49.04	0.0319	0.0275
"	2.0	98.08	0.0335	0.0251
"	3.0	147.12	0.0256	0.0229
"	4.0	196.16	0.0233	0.0209
"	5.0	245.20	0.0231	0.0194
Potassium Hydroxide	0.5	28.08	0.0291	0.0252
"	1.0	56.16	0.0234	0.0206
Sodium Hydroxide	0.5	20.03	0.0288	0.0250
"	1.0	40.06	0.0231	0.0204
"	2.0	80.12	0.0152	0.0133
Potassium Sulphate	0.5	43.59	0.0294	0.0253
"	1.0	87.18	0.0237	0.0207
Sodium Chloride	0.5	29.25	0.0308	0.0262
"	1.0	58.5	0.0260	0.0223
"	2.0	119.0	0.0182	0.0158

\* In terms of the Ostwald Solubility Expressions. See page 105.

## SOLUBILITY OF OXYGEN IN Aq. POTASSIUM CYANIDE SOLUTIONS AT 20°.

(MacLaurin — J. Ch. Soc. 63, 737, '93.)

Gms. KCN per 100 gms. sol.	1	10	20	30	50
Coefficient of absorption of O	0.029	0.018	0.013	0.008	0.003

### SOLUBILITY OF OXYGEN IN ETHYL ALCOHOL, METHYL ALCOHOL AND IN ACETONE.

(Timofejew — Z. physik. Ch. 6, 151, '90; Levi — Gazz. chim. ital. 31, II, 513, '01.)

t°.	In Ethyl Alcohol of 99.7% (T.).		In Methyl Alcohol (L.)	In Acetone (L.)
	$\beta$ .	$\beta'$ .	$l =$	$l =$
0	0.2337	0.2297	0.31864	0.2997
5	0.2301	0.2247	0.30506	0.2835
10	0.2266	0.2194	0.29005	0.2667
15	0.2232	0.2137	0.27361	0.2493
20	0.2201	0.2073	0.25574	0.2313
25	0.2177 (24°)	0.2017 (24°)	0.23642	0.2127
30	...	...	0.21569	0.1935
40	...	...	0.16990	0.1533
50	...	...	0.11840	0.1057

For values of  $\beta$  and  $\beta'$ , see Ethane, page 133.  $l$  = Ostwald Solubility Expression. See page 105.

The formulae expressing the solubility of oxygen in methyl alcohol and in acetone as shown in the above table are as follows:

$$\begin{aligned} \text{In Methyl Alcohol } l &= 0.31864 - 0.002572 t - 0.00002866 t^2. \\ \text{In Acetone } l &= 0.2997 - 0.00318 t - 0.000012 t^2. \end{aligned}$$

### SOLUBILITY OF OXYGEN IN AQUEOUS ALCOHOL AT 20° AND 760 MM.

(Lubarsch — Wied. Ann. [2] 37, 525, '89.)

Wt. per cent Alcohol.	Vol. per cent Absorbed O.	Wt. per cent Alcohol.	Vol. per cent Absorbed O.	Wt. per cent Alcohol.	Vol. per cent Absorbed O.
0.00	2.98	23.08	2.52	50.0	3.50
9.09	2.78	28.57	2.49	66.67	4.95
16.67	2.63	33.33	2.67	80.0	5.66

### SOLUBILITY OF OXYGEN IN PETROLEUM. COEFFICIENT OF ABSORPTION AT 10° = 0.229, AT 20° = 0.202.

(Gniewasz and Walfisz — Z. physik. Ch. 2, 70, '87.)

### OZONE O<sub>3</sub>.

#### SOLUBILITY IN WATER.

(von Mailfert — Compt. rend. 119, 951, '94; Carius; Schöne — Ber. 6, 1224, '73.)

t°.	W.	G.	R.	t°.	W.	G.	R.
0	39.4	61.5	0.641	27	13.9	51.4	0.270
6	34.3	61.0	0.562	33	7.7	39.5	0.195
11.8	29.9	59.6	0.500	40	4.2	37.6	0.112
13.0	28.0	58.1	0.482	47	2.4	31.2	0.077
15.0	25.9	56.8	0.456	55	0.6	19.3	0.031
19.0	21.0	55.2	0.381	60	0.0	12.3	0.000

$W$  = Milligrams Ozone dissolved per liter water.  $G$  = Milligrams Ozone in one liter of the gas phase above the solutions.  $R$  = Ratio of the dissolved to undissolved Ozone ( $W + G$ ).



# **PARAFFINE**

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## **SOLUBILITY OF OZOKERITE PARAFFINE OF MELTING POINT 64°-65° AND SP. GR. AT 20° = 0.917 IN SEVERAL SOLVENTS AT 20°.**

(Pawlewski and Filemonowicz — Ber. 21, 2973, '88.)

Solvent.	Gms. Paraffine per 100		Solvent.	Gms. Paraffine per 100	
	Gms. Solvent.	cc. Solvent.		Gms. Solvent.	cc. Solvent.
Carbon Bisulphide	12.99	...	Acetone	0.262	0.209
Benzine, boiling below 75°	11.73	8.48	Ethyl Acetate	0.238	...
Turpentine, b.pt. 158°-166°	6.06	5.21	" Alcohol	0.219	...
Cumol, com. b.pt. 160°	4.26	3.72	Amyl Alcohol	0.202	0.164
" frac. 150°-160°	3.99	3.39	Propionic Acid	0.165	...
Xylene, com.b.pt. 135°-143°	3.95	3.43	Propyl Alcohol	0.141	...
" frac. 135°-138°	4.39	3.77	Methyl Alcohol	0.071	0.056
Toluene, com.b.pt. 108°-110°	3.88	3.34	Methyl Formate	0.060	...
" frac. 108°-109°	3.92	3.41	Acetic Acid	0.060	0.063
Chloroform	2.42	3.61	" Anhydride	0.025	...
Benzene	1.99	1.75	Formic Acid	0.013	0.015
Ethyl Ether	1.95	...	Ethyl Alcohol 75%	0.0003	...
Iso Butyl Alcohol, com.	0.285	0.228			

# **PAPAVERINE C<sub>20</sub>H<sub>21</sub>NO<sub>4</sub>.**

100 grams pure carbon tetra chloride dissolve 0.203 gram at 17°.  
(Schindelmeyer — Chem.-Ztg. 25, 129, '01.)

# **PHENANTHRENE C<sub>14</sub>H<sub>10</sub>.**

## **SOLUBILITY IN ALCOHOL AND IN TOLUENE.\***

(Speyers — Am. J. Sci. [4] 14, 295, '02.)

t°.	In Alcohol.		In Toluene.	
	Gms. C <sub>14</sub> H <sub>10</sub> per 100 Grams C <sub>2</sub> H <sub>5</sub> OH.	Sp. Gr. of Solutions (H <sub>2</sub> O at 4°.)	Gms. C <sub>14</sub> H <sub>10</sub> per 100 Grams C <sub>6</sub> H <sub>6</sub> CH <sub>3</sub>	Sp. Gr. of Solutions (H <sub>2</sub> O at 4°.)
0	3.65	0.814	23.0	0.925
10	3.80	0.807	30.0	0.929
20	4.6	0.801	42.0	0.934
25	5.5	0.799	50.0	0.939
30	6.4	0.797	58.0	0.943
40	8.2	0.795	76.0	0.955
50	10.6	0.794	95.0	0.971
60	15.6	0.797	115.0	0.989
70	33.0	0.815	135.0	1.007
80	...	0.865 (76.4°)	155.0	1.027

\* Calculated from the original results which are given in terms of gram molecules of Phenanthrene per 100 gram molecules of solvent, and for irregular intervals of temperature.

Behrend — Z. physik. Ch. 10, 265, '92, finds 2.77 grams phenanthrene per 100 grams alcohol at 12.3°, and 3.09 grams at 14.8°.

**SOLUBILITY OF PHENANTHRENE PICRATE IN ABSOLUTE ALCOHOL.**  
(Behrend — Z. physik. Ch. 10, 205, '92.)

t°.	Grams per 100 Grams Saturated Solution.		
	Picric Acid	+ Phenanthrene	= Phenanthrene Picrate.
12.3	0.91	0.71	1.62
14.3	1.00	0.78	1.78
17.5	1.05	0.82	1.87

**SOLUBILITY OF PHENANTHRENE PICRATE IN ALCOHOLIC SOLUTIONS CONTAINING PICRIC ACID AND ALSO PHENANTHRENE.**  
(Behrend.)

t°.	Grams Added to 62 cc. Abs. Alcohol.			Gms. per 100 Gms. Sat. Solution.		
	P. Picrate	+ Picric Ac.	+ Phenanthrene.	Picric Ac.	+ Phenanthrene	= P. Picrate.
12.3	1.4	0	0.5	0.534	1.413	1.947
12.3	1.4	0	0.9	0.409	2.141	2.550
12.3	0.8	0	2.1	0.354	2.77	3.124
12.3	0.8	0	4.0	0.139	5.626	5.765
17.5	1.4	0.1	0	1.159	0.75	1.91
17.5	1.4	0.2	0	1.285	0.68	1.97
17.5	1.4	1.0	0	2.45	0.37	2.82
17.5	1.4	4.0	0	6.15	0.195	6.345
17.5	1.4	0.0	2.2	0.423	3.276	3.699

**PHENOL  $C_6H_5OH$ .**

**SOLUBILITY IN WATER.**

(Alexejew — Wied. Ann. 28, 305, '86; Schreinemaker — Z. physik. Ch. 33, 79, '00; Rothmund — *Ibid* 26, 474, '98.)

Determinations were made by the "Synthetic Method," for which see Note, page 9.

t°.	Grams Phenol per 100 Grams	
	Aqueous Layer.	Phenol Layer.
10	7.5	75.0
20	8.3	72.1
30	8.8	69.8
40	9.6	66.9
50	12.0	62.7
55	14.1	59.5
60	16.7	55.4
65	21.9	49.2
68.3 (crit. temp.)		33.4

Vaubel — J. pr. Ch. [2] 52, 73, '95, states that 100 grams sat. aqueous solution contain 6.1 grams phenol at 20°. Sp. Gr. of solution = 1.0057.

**SOLUBILITY OF PHENIC ACID ( $C_6H_5OH$ ) IN PARAFFINE AND IN BENZENE.**  
(Schweissinger — Pharm. Ztg. '84-'85.)

Solvent.	Grams $C_6H_5OH$ per 100 Grams Solvent at:			
	16°.	21°.	25°.	43°.
Paraffine	1.66	...	...	5.0
Benzene	2.5	8.33	10.0	100.0

## SOLUBILITY OF PHENOL IN AQUEOUS ACETONE SOLUTIONS.

(Schreinemaker.)

t°.	In 4.24 % Acetone.		In 12.2% Acetone.		In 24.4% Acetone.		In 59.9% Acetone.	
	Gms. Phenol per 100 Gms.		Gms. Phenol per 100 Gms.		Gms. Phenol per 100 Gms.		Gms. Phenol per 100 Gms.	
	Aq. Acetone Layer.	Phenol Layer.	Aq. Acetone Layer.	Phenol Layer.	Aq. Acetone Layer.	Phenol Layer.	Aq. Acetone Layer.	Phenol Layer.
20	...	...	...	...	...	...	26.0	60.5
30	5.0	74.0	4.0	71.0	6.0	69.5	28.5	57.0
40	5.5	70.0	...	...	...	...	32.0	52.0
50	5.7	67.0	5.0	67.0	8.0	64.0	34.5§	49.0§
60	6.5	61.0	...	...	...	...	36.5	46.5
70	9.0	51.0	7.5	57.5	19.0	57.0	(49.5°)	41.5
80	14.0	34.0	10.5	49.5	14.0	52.5		
	(84°) 22.5		20.4*	30.5*	23.0†	47.0†		
			(90.3°) 25.0		26.5‡	44.0‡		
					(90.5°) 35.0			
	90°		185°		187°-5	145°	147°-5	

The figures in the above table were read from curves plotted from the original results.

SOLUBILITY OF PHENOL IN AQUEOUS SOLUTIONS *d* TARTARIC ACID.

(Schreinemaker.)

In 5.093% Acid.			In 19.34% Acid.			In 40.9% Acid.		
t°.	Gms. Phenol per 100 Gms.		t°.	Gms. Phenol per 100 Gms.		t°.	Gms. Phenol per 100 Gms.	
	Aq. Acid Layer.	Phenol Layer.		Aq. Acid Layer.	Phenol Layer.		Aq. Acid Layer.	Phenol Layer.
30	7.5	72.5	50	10.0	77.0	70	13.0	...
50	10.5	65.5	60	12.5	72.0	80	16.5	77.0
60	14.5	58.0	70	19.0	64.0	85	20.0	74.0
65	19.5	53.0	75	29.0	56.0	90	26.5	71.0
67.5	25.0	48.5	77	47.0		95	39.0	63.5
69	47.5					97	54.0	

## DISTRIBUTION OF PHENOL BETWEEN:

## AMYL ALCOHOL AND WATER AT 25°.

(Herz and Fischer — Ber. 37, 4747, '04.)

## BENZENE AND WATER AT 20°.

(Vaubel — J. pr. Ch. [2] 67, 476, 'c3.)

Millimols Phenol per 10 cc.		Gms. Phenol per 100 cc.		Volumes of Solvents used per 1 Gm. Phenol	Gms. Phenol in:	
Alcoholic Layer.	Aqueous Layer.	Alcoholic Layer.	Aqueous Layer.		H <sub>2</sub> O Layer.	C <sub>6</sub> H <sub>6</sub> Layer.
0.75	0.047	0.705	0.0441	50 cc. H <sub>2</sub> O +	0.286	0.714
0.9	0.05	0.846	0.047	" + 100 cc. "	0.1188	0.8212
1.1	0.07	1.035	0.066	" + 150 cc. "	0.0893	0.9107
2.6	0.16	2.445	0.150	" + 200 cc. "	0.0893	0.9107
54.1	3.83	50.88	3.601			
56.3	3.9	52.93	3.667			

DISTRIBUTION OF PHENOL BETWEEN WATER AND BENZENE AND BETWEEN AQUEOUS  $K_2SO_4$  SOLUTIONS AND BENZENE AT  $25^\circ$ .

(Rothmund and Wilmore — Z. physik. Ch. 40, 623, '02.)

NOTE. — The original results, which are given in terms of gram mols. per liter, were calculated to grams per liter, and plotted on cross-section paper. The following figures were read from the curves obtained.

Between $H_2O$ and $C_6H_6$ .		Effect of $K_2SO_4$ upon the Distribution.					
Grams $C_6H_5OH$ per Liter of:		Gms. $K_2SO_4$ per Liter Aq. Solution.	(1) Gms. $C_6H_5OH$ per Liter of:		(2) Gms. $C_6H_5OH$ per Liter of:		
$H_2O$ Layer.	$C_6H_6$ Layer.		Aq. Layer.	$C_6H_6$ Layer.	Aq. Layer.	$C_6H_6$ Layer.	
5	10	1.36	17.08	59.96	9.52	26.28	
10	28	2.72	16.92	60.63	9.50	26.38	
15	52	5.44	16.85	60.92	9.46	26.55	
20	84	10.89	16.44	62.73	9.35	27.06	
25	128	21.79	15.89	65.19	9.09	28.27	
30	200	43.59	14.85	69.71	8.68	30.21	
35	300	87.18	12.92	78.00	7.79	34.38	
40	410						
45	520						
50	610						

(1) First series.

(2) Second series.

DISTRIBUTION OF PHENOL AT  $25^\circ$  BETWEEN:

(Herz and Fischer — Ber. 38, 1143, '05.)

Water and Toluene.

Millimols $C_6H_5OH$ per 10 cc.		Grams $C_6H_5OH$ per 100 cc.	
$C_6H_5CH_3$ Layer.	$H_2O$ Layer.	$C_6H_5CH_3$ Layer.	$H_2O$ Layer.
1.244	0.724	1.169	0.681
3.047	1.469	2.865	1.381
4.667	2.200	4.389	2.068
6.446	2.861	6.061	2.691
14.960	4.750	14.07	4.467
17.725	5.346	16.69	5.027
47.003	7.706	44.20	7.246
53.783	8.087	50.58	7.604
90.287	9.651	84.89	9.074

Water and *m* Xylene.

Millimols $C_6H_5OH$ per 10 cc.		Grams $C_6H_5OH$ per 100 cc.	
$mC_6H_4(CH_3)_2$ Layer.	$H_2O$ Layer.	$mC_6H_4(CH_3)_2$ Layer.	$H_2O$ Layer.
1.610	1.071	1.514	1.007
4.787	2.726	4.501	2.563
12.210	5.168	11.22	4.860
22.718	6.994	21.36	6.577
34.827	8.124	32.75	7.640
51.352	9.123	48.28	8.578
77.703	10.050	73.07	9.450

DISTRIBUTION OF PHENOL BETWEEN WATER AND CARBON TETRACHLORIDE AT  $20^\circ$ .

(Vaubel — J. pr. Ch. [2] 67, 476, '03.)

Gms. Phenol Used.	Volumes of Solvents.		Grams Phenol in:	
			$H_2O$ Layer.	$CCl_4$ Layer.
1	50 cc. $H_2O$ + 10 cc. $CCl_4$		0.8605	0.1285
1	" + 20 cc. "		0.7990	0.1900
1	" + 30 cc. "		0.7275	0.2615
1	" + 50 cc. "		0.6435	0.3455
1	" + 100 cc. "		0.4680	0.5210
1	" + 150 cc. "		0.3645	0.6245
1	" + 200 cc. "		0.3240	0.6650

## PHENOLATE

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### PHENOLATE of Phenyl Ammonium.

#### SOLUBILITY IN WATER.

Figures read from Curve. (Alexejew — Wied. Ann. 28, 305, '86.)

By Synthetic Method, See page 9.

t°.	Gms. Phenolate per 100 Gms.		t°.	Gms. Phenolate per 100 Gms.	
	Aq. Layer.	Phenolate Layer.		Aq. Layer.	Phenolate Layer.
10	3	94	110	9	76
30	4	93	120	12	69
50	5	91	130	17.5	60
70	6	87.5	140 (crit. temp.)	40	
90	7	83			

### PHENYL (Di) AMINES $C_6H_4(NH_2)_2$ .

#### SOLUBILITY IN WATER AT 20°.

(Vaubel — J. pr. Ch. [2] 52, 73, '95.)

Amine.	Gms. per 100 Gms. Solution.	Sp. Gr. of Solution.
<i>m</i> Phenyl di Amine	23.8	1.0317
<i>p</i> “	3.7	1.0038

### Nitro PHENOLS $C_6H_4.OH.NO_2$ .

100 grams saturated aqueous solution contain: 0.208 gram ortho, 2.14 grams meta, 1.32 grams para nitro phenol at 20°.

(Vaubel.)

### Di Nitro PHENOL $C_6H_3.OH.(NO_2)_2$ .

#### SOLUBILITY IN ALCOHOLS AT 19.5°.

(de Bruyn — Z. physik. Ch. 10, 784, '92.)

100 grams abs. methyl alcohol dissolve 6.3 grams  $C_6H_3.OH.(NO_2)_2$ .

100 grams abs. ethyl alcohol dissolve 3.9 grams  $C_6H_3.OH.(NO_2)_2$ .

### SOLUBILITY OF MIXTURES OF *s* TRI BROM PHENOL AND *s* TRI CHLOR PHENOL IN METHYL ALCOHOL AT 25°.

(Thiel — Z. physik. Ch. 43, 667, '03; from Wurfel — Dissertation Marburg, '96.)

Molecular per cent $C_6H_2.OH.Br_3$		* Solubility of		Total.
In Solid.	In Solution.	$C_6H_2.OH.Cl_3$	$C_6H_2.OH.Br_3$	
0	0	0.204	0	0.204
4.49	3.59	0.194	0.007	0.201
10.13	7.58	0.191	0.016	0.206
16.28	12.15	0.172	0.024	0.196
62.44	13.07	0.204	0.031	0.235
69.88	15.86	0.150	0.028	0.178
81.76	19.01	0.096	0.023	0.118
84.66	24.05	0.069	0.022	0.091
87.53	32.46	0.043	0.021	0.063
93.62	47.87	0.021	0.019	0.040
100.0	100.0	0.0	0.019	0.019

**PHENYL SALICYLATE** (Salol)  $C_6H_4(OH).COOC_6H_5$  1:2.

100 grams  $H_2O$  dissolve 0.043 gram salicylate at  $25^\circ$ . 100 grams alcohol dissolve 20.0 grams at  $25^\circ$ .

(U. S. P.)

**Di PHENYL**  $C_6H_5.C_6H_5$ .

100 grams absolute methyl alcohol dissolve 6.57 grams at  $19.5^\circ$ .  
100 grams abs. ethyl alcohol dissolve 9.98 grams at  $19.5^\circ$ .

(de Bruyn — Z. physik. Ch. 10, 784, '92.)

**PHOSPHO MOLYBDIC ACID**  $P_2O_5.20MoO_3.52H_2O$ .

## SOLUBILITY IN ETHER.

(Parmentier — Compt. rend. 104, 686, '87.)

$t^\circ$	$0^\circ$	$8.1^\circ$	$19.3^\circ$	$27.4^\circ$	$32.9^\circ$
Gms. Acid per 100 gms. Ether	80.6	84.7	96.7	103.9	107.9

**PHOSPHORUS** P. (yellow)

## SOLUBILITY IN BENZENE.

(Christomanos — Z. anorg. Ch. 45, 136, '05.)

$t^\circ$	Gms. P per 100 Gms. $C_6H_6$ .	Sp. Gr. of Solution.	$t^\circ$	Gms. P per 100 Gms. $C_6H_6$ .	Sp. Gr. of Solution.	$t^\circ$	Gms. P per 100 Gms. $C_6H_6$ .
0	1.513	...	23	3.399	0.8875	50	6.80
5	1.99	...	25	3.70	0.8861	55	7.32
8	2.31	0.8990	30	4.60	...	60	7.90
10	2.4	0.8985	35	5.17	...	65	8.40
15	2.7	0.894	40	5.75	...	70	8.90
18	3.1	0.892	45	6.11	...	75	9.40
20	3.2	0.890				81	10.03

## SOLUBILITY OF PHOSPHORUS IN ETHER.

(Christomanos.)

$t^\circ$	Gms. P per 100 Gms. $(C_2H_5)_2O$ .	Sp. Gr. of Solutions.	$t^\circ$	Gms. P per 100 Gms. $(C_2H_5)_2O$ .	Sp. Gr. of Solutions.	$t^\circ$	Gms. P per 100 Gms. $(C_2H_5)_2O$ .
0	0.434	...	15	0.90	0.723	28	1.60
5	0.62	...	18	1.01	0.719	30	1.75
8	0.79	0.732	20	1.04	0.718	33	1.80
10	0.85	0.729	23	1.12	0.722	35	2.00
			25	1.39	0.728		

100 grams  $CS_2$  dissolve about 1750 grams yellow P at room temperature.

(Vogel — Jahresber. Chem. 149, '68.)

100 grams alcohol of 0.799 Sp. Gr. dissolve 0.312 gram P cold and 0.416 gram hot.

(Buchner)

## PHOSPHORUS

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### SOLUBILITY OF YELLOW PHOSPHORUS IN SEVERAL SOLVENTS AT 15°.

(Stich — Pharm. Ztg. 48, 343, '03.)

Solvent.	Gms. P per 100 Gms. Solution.
Almond Oil	1.25
Oleic Acid	1.06
Paraffine	1.45
Water	0.0003
Acetic Acid	0.105

## PHTHALIC ACIDS $C_6H_4(COOH)_2$ .

### SOLUBILITY IN WATER.

(Vaubel — J. pr. Ch. [2] 52, 73, '95; 59, 30, '99.)

Acid.	t °.	Gms. per 100 Gms. Solution.
<i>o</i> Phthalic Acid	14	0.54
Iso Phthalic Acid	25	0.013
Tere Phthalic Acid	..	almost insoluble

### SOLUBILITY OF *o* PHTHALIC ACID IN ALCOHOL AND IN ETHER AT 15°.

(Bourgoin — Ann. chim. phys. [5] 13, 406, '78.)

Solvent.	Grams $C_6H_4(COOH)_2$ per 100 Grams	
	Solution.	Solvent.
Absolute Alcohol	9.156	11.70
90 per cent Alcohol	10.478	10.08
Ether	0.679	0.684

## PHTHALIC ANHYDRIDE $C_6H_4<\overset{CO}{\underset{CO}{O}}$ .

### SOLUBILITY IN WATER.

(van der Stadt — Z. physik. Ch. 41, 358, '02.)

All determinations, except first three, made by the Synthetic Method.  
See page 9.

t °.	Grams $C_6H_4O_3$ per 100 Gms.		Mol. per cent $C_6H_4O_3$ .	t °.	Grams $C_6H_4O_3$ per 100 Gms.		Mol. per cent $C_6H_4O_3$ .
	Water.	Solution.			Water.	Solution.	
0	0.00295	0.00295	0.00036	189.5	1076	91.66	56.73
25	0.6194	0.6150	0.0754	188.8	1265	92.68	60.63
50	1.630	1.604	0.198	187.1	1474	93.65	64.22
135.9	94.3	48.54	10.30	181.8	2332	95.88	73.95
165.4	210.0	67.75	20.36	176.2	3334	97.07	80.23
179.4	319.3	76.13	27.98	169.4	5745	98.28	87.49
186.2	449.6	81.81	35.37	130.9	37570	99.72	97.89
189.6	546.1	84.50	39.93	131.0	83010	99.86	99.02
191.0	821.5	89.19	50.00	131.2	∞	100.00	100.00
190.4	863.4	89.62	51.24				

On page 362 of the original paper the solubility of  $C_6H_4O_3$  at 0° is given as 0.2722 gram per 100 grams of solution.

## SOLUBILITY OF PHTHALIC ANHYDRIDE IN CARBON BISULPHIDE.

(Arctowski — Compt. rend. 121, 123, '95; Etard — Ann. chim. phys. [7] 2, 570, '94.)

t°.	Gms. C <sub>6</sub> H <sub>4</sub> O <sub>3</sub> per 100 Gms. Solution.	t°.	Gms. C <sub>6</sub> H <sub>4</sub> O <sub>3</sub> per 100 Gms. Solution.	t°.	Gms. C <sub>6</sub> H <sub>4</sub> O <sub>3</sub> per 100 Gms. Solution.
-112.5	0.013	+10	0.3	70	2.3
-93	0.013	20	0.7	90	3.7
-77.5	0.016	30	0.8	100	5.0
-40	0.03	40	1.2	120	8.0
-20	0.06	50	1.3	140	13.3
-10	0.10	60	1.7	160	20.7
0	0.20			180	30.2

**PHYSOSTIGMINE SALICYLATE** C<sub>8</sub>H<sub>7</sub>(OH)COOH.C<sub>15</sub>H<sub>21</sub>N<sub>2</sub>O<sub>2</sub> and  
 Physostigmine Sulphate H<sub>2</sub>SO<sub>4</sub>(C<sub>15</sub>H<sub>21</sub>N<sub>2</sub>O<sub>2</sub>)<sub>2</sub>.

SOLUBILITY IN WATER, ALCOHOL, ETC.  
(U. S. P.)

Solvent.	t°.	Gms. per 100 Gms. Solvent.	
		Salicylate.	Sulphate.
Water	25	1.38	very soluble
Water	80	6.66	"
Alcohol	25	7.87	"
Alcohol	60	25.00	"
Chloroform	25	11.6	"
Ether	25	0.57	0.083

**PICRIC ACID** C<sub>6</sub>H<sub>3</sub>OH.(NO<sub>2</sub>)<sub>3</sub>.

## SOLUBILITY IN WATER.

(Dolinski — Ber. 38, 1836, '05; Findlay — J. Ch. Soc. 81, 1219, '02.)

t°.	Gms. C <sub>6</sub> H <sub>2</sub> N <sub>2</sub> O <sub>7</sub> per 100 Grams			t°.	Gms. C <sub>6</sub> H <sub>2</sub> N <sub>2</sub> O <sub>7</sub> per 100 Grams		
	Solution.	Water.			Solution.	Water.	
0	0.67 (D.)	0.68 (D.)	1.05 (F.)	60	2.77 (D.)	2.81 (D.)	3.17 (F.)
10	.80	0.81	1.10	70	3.35	3.47	3.89
20	1.10	1.11	1.22	80	4.22	4.41	4.66
30	1.38	1.40	1.55	90	5.44	5.72	5.49
40	1.75	1.78	1.98	100	6.75	7.24	6.33
50	2.15	2.19	2.53				

Dolinski does not refer to the previous determinations of Findlay.



# **PICRIC ACID**

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## **SOLUBILITY OF PICRIC ACID IN WATER AND IN AQUEOUS SALT SOLUTIONS AT 25°.**

(Levin — Z. physik. Ch. 55, 520, '06.)

One liter of aqueous solution contains 0.05328 gram mols. = 12.20 grams  $C_6H_3OH(NO_2)_3$  at 25°.

Gm. Mols. Salt per Liter.	Gram Mols. Picric Acid per Liter in Aq. Solutions of:					
	NaCl.	NaNO <sub>3</sub> .	Na <sub>2</sub> SO <sub>4</sub> .	LiCl.	Li <sub>2</sub> SO <sub>4</sub> .	NH <sub>4</sub> Cl.
0.01	0.05524	0.05529	0.05604	0.05480	0.05661	0.05487
0.02	0.05559	0.05872	0.05872	0.05558	0.06053	0.05540
0.05	0.05729	0.06632	0.06632	0.05703	0.06691	0.05771
0.07	0.05862	0.07093	0.07093	0.05878	0.07013	0.05865
0.10	0.05902	0.07670	0.07670	0.06132	0.07437	...
0.50	0.0790	...	...	...	0.123	...
1.00	0.1180	...	...	...	0.149	...

Gm. Mols. Salt per Liter.	Grams Picric Acid per Liter in Aq. Solutions of:					
	NaCl.	NaNO <sub>3</sub> .	Na <sub>2</sub> SO <sub>4</sub> .	LiCl.	Li <sub>2</sub> SO <sub>4</sub> .	NH <sub>4</sub> Cl.
0.01	12.66	12.67	12.83	12.55	12.97	12.57
0.02	12.74	13.45	13.45	12.74	13.87	12.69
0.05	13.12	15.19	15.19	13.06	15.33	13.22
0.07	13.43	16.25	16.25	13.47	16.06	13.44
0.10	13.52	17.57	17.57	14.05	17.04	...
0.50	18.09	...	...	...	28.18	...
1.00	26.98	...	...	...	34.14	...

## **Solubility in Aq. Cane Sugar.**

## **Solubility in Aq. Grape Sugar.**

Gm. Mols. Sugar per Liter.	Picric Ac. per Liter Solution.		Sp. Gr. Solution.	Gm. Mols. Grape Sugar per Liter.	Picric Acid per Liter Sol.	
	Gm. Mols.	Gms.			G. Mols.	Gms.
0.10	0.05202	11.92	1.0122	0.10	0.0530	12.14
0.25	0.04978	11.40	1.0319	0.25	0.0521	11.93
0.50	0.0482	11.04	1.0654	0.50	0.0509	11.66
1.00	0.0443	10.15	1.1294	1.00	0.0474	10.86

## **SOLUBILITY OF PICRIC ACID IN ABSOLUTE ALCOHOL.**

(Behrend — Z. physik. Ch. 10, 265, '92.)

100 gms. sat. solution contain 5.53 grams  $C_6H_3N_3O_7$  at 12.3°, and 5.92 grams at 14.8°. Sp. Gr. of the latter solution = 0.8255.

## **SOLUBILITY OF PICRIC ACID IN BENZENE.**

(Findlay.)

t°.	Gms. C <sub>6</sub> H <sub>3</sub> N <sub>3</sub> O <sub>7</sub> per 100 Gms. C <sub>6</sub> H <sub>6</sub> .	Mols. C <sub>6</sub> H <sub>3</sub> N <sub>3</sub> O <sub>7</sub> per 100 Mols. C <sub>6</sub> H <sub>6</sub> .	t°.	Gms. C <sub>6</sub> H <sub>3</sub> N <sub>3</sub> O <sub>7</sub> per 100 Gms. C <sub>6</sub> H <sub>6</sub> .	Mols. C <sub>6</sub> H <sub>3</sub> N <sub>3</sub> O <sub>7</sub> per 100 Mols. C <sub>6</sub> H <sub>6</sub> .
5	3.70	1.26	38.4	26.15	8.88
10	5.37	1.83	45	33.57	11.40
15	7.29	2.48	55	50.65	17.21
20	9.56	3.25	58.7	58.42	19.83
25	12.66	4.30	65	71.31	24.20
26.5	13.51	4.60	75	96.77	32.92
35	21.38	7.26			

## SOLUBILITY OF PICRIC ACID IN ETHER.

(Bougault — J. pharm. chim. [6] 18, 116, '03; — Apoth.-Ztg. 21, 74, '06.)

Solvent.	t°.	Gms. $C_6H_3N_3O_7$ per Liter.
Ether of Sp. Gr. 0.721	13	10.8 (B.)
Ether of Sp. Gr. 0.725 (0.8 pt. $H_2O$ per 100)	13	36.8 "
Ether of Sp. Gr. 0.726 (1.0 pt. $H_2O$ per 100)	13	40.0 "
Ether saturated with $H_2O$	15	51.2
$H_2O$ saturated with Ether	15	13.8

## DISTRIBUTION OF PICRIC ACID AT 25° BETWEEN:

## Water and Amyl Alcohol.

(Herz and Fischer — Ber. 37, 4747, '04.)

Millimols $C_6H_3N_3O_7$ per 10 cc.		Gms. $C_6H_3N_3O_7$ per 100 cc.	
Aq. Layer.	Alcohol Layer.	Aq. Layer.	Alcohol Layer.
0.0553	0.0930	0.127	0.213
0.0920	0.1850	0.211	0.424
0.1613	0.4127	0.369	0.946
0.1869	0.5182	0.428	1.188
0.3161	1.079	0.724	2.473
0.4471	1.638	1.024	3.753
0.5624	2.189	1.288	5.017
0.6423	2.549	1.472	5.839

## Water and Toluene.

(H. and F. — Ber. 38, 1142, '05.)

Millimols $C_6H_3N_3O_7$ per 10 cc.		Gms. $C_6H_3N_3O_7$ per 100 cc.	
Aq. Layer.	Toluene Layer.	Aq. Layer.	Toluene Layer.
0.075	0.126	0.172	0.289
0.109	0.230	0.250	0.527
0.163	0.482	0.374	1.104
0.244	1.026	0.559	2.351
0.389	2.347	0.891	5.380
0.496	3.747	1.137	8.586
0.583	5.135	1.336	11.770

## DISTRIBUTION OF PICRIC ACID AT 25° BETWEEN:

## Water and Bromoform.

(Herz and Lewy — Z. Electrochem. 11, 820, '05.)

Millimols $C_6H_3N_3O_7$ per 10 cc.		Gms. $C_6H_3N_3O_7$ per 100 cc.	
Aq. Layer.	Bromoform Layer.	Aq. Layer.	Bromoform Layer.
0.321	0.365	0.736	0.836
0.401	0.515	0.919	1.180
0.475	0.655	1.088	1.501
0.575	0.871	1.317	1.995
0.674	1.14	1.545	2.612

## Water and Chloroform.

(H. and L.)

Millimols $C_6H_3N_3O_7$ per 10 cc.		Gms. $C_6H_3N_3O_7$ per 100 cc.	
Aq. Layer.	Chloroform Layer.	Aq. Layer.	Chloroform Layer.
0.207	0.254	0.474	0.582
0.329	0.547	0.754	1.253
0.488	1.09	1.118	2.498
0.561	1.41	1.285	3.230
0.588	1.53	1.348	3.505

**PILOCARPINE HYDROCHLORIDE**  $C_{11}H_{18}N_2O_2 \cdot HCl$ , Pilocarpine Nitrate  $C_{11}H_{18}N_2O_2 \cdot HNO_3$ , and Piperine  $C_{17}H_{19}NO_3$  in Several Solvents.

(U. S. P.)

Solvent.	t°.	Grams per 100 Grams Solvent.		
		$C_{11}H_{18}N_2O_2 \cdot HCl$ .	$C_{11}H_{18}N_2O_2 \cdot HNO_3$ .	$C_{17}H_{19}NO_3$ .
Water	25	333	25	insoluble
Alcohol	25	4.35	1.66	6.66
Alcohol	60	9.09	6.2	22.7
Chloroform	25	0.18	...	58.8
Ether	25	...	...	2.8

# PLATINUM ALLOYS

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## SOLUBILITY OF PLATINUM ALLOYS IN NITRIC ACID.

(Winkler — Z. anal. Ch. 13, 369, '74.)

Alloy.	Approx. per cent Pt in Alloy.	Grams Alloy Dissolved per 100 Grams HNO <sub>3</sub> Solution of			
		1.398 Sp. Gr.	1.298 Sp. Gr.	1.190 Sp. Gr.	1.298 Sp. Gr.
Pt and Silver	10	57	44	69	37
"	5	69	57	51	35
"	2.5	62	61	69	..
"	1	75	70	76	..
Pt and Copper	10	46	27	11	51
"	5	36	34	14	41
"	2.5	51	40	30	..
"	1	52	41	37	..
Pt and Lead	10	7	9	8	..
"	5	8	9	10	..
"	2.5	22	17	11	..
"	1+	21	18	23	..
Pt and Bismuth	10	14	19	4	3
"	5	21	20	6	18
"	2.5	25	42	8	..
"	1	49	64	10	..
Pt and Zinc	10	10	11	19	5
"	5	16	12	6	11
"	2.5	16	24	19	..
"	1	20	32	37	..

## PLATINUM BROMIDE PtBr<sub>4</sub>.

100 grams sat. aqueous solution contain 0.41 gram PtBr<sub>4</sub> at 20°  
(Halberstadt — Ber. 17, 2962, '84.)

## PLATINIC POTASSIUM BROMIDE K<sub>2</sub>PtBr<sub>6</sub>.

100 grams sat. aqueous solution contain 2.02 grams K<sub>2</sub>PtBr<sub>6</sub> at 20°.  
(Halberstadt.)

## PLATINIC DOUBLE CHLORIDES of Ammonium, Caesium, Potassium, Rubidium and Thallium.

### SOLUBILITY IN WATER.

(Crookes — Chem. News 9, 37, 205, '64; Bunsen — Pogg. Ann. 113, 337, '61.)

t°.	Grams per 100 Grams Water.				
	(NH <sub>4</sub> ) <sub>2</sub> PtCl <sub>6</sub> .	Cs <sub>2</sub> PtCl <sub>6</sub> .	K <sub>2</sub> PtCl <sub>6</sub> .	Rb <sub>2</sub> PtCl <sub>6</sub> .	Tl <sub>2</sub> PtCl <sub>6</sub> .
0	...	0.024	0.74	0.184	...
10	0.666 (15°)	0.050	0.90	0.154	0.0064 (15°)
20	...	0.079	1.12	0.141	...
25	...	0.095	1.26	0.143	...
30	...	0.110	1.41	0.145	...
40	...	0.142	1.76	0.166	...
50	...	0.177	2.17	0.203	...
60	...	0.213	2.64	0.253	...
70	...	0.251	3.19	0.329	...
80	...	0.291	3.79	0.417	...
90	...	0.332	4.45	0.521	...
100	1.25	0.377	5.18	0.634	0.050

SOLUBILITY OF AMMONIUM PLATINIC CHLORIDE AND OF POTASSIUM PLATINIC CHLORIDE IN ALCOHOL AT 15°-20°.

(Fresenius; Peligot — Z. anal. Ch. 36, 322, '97.)

Solvent	Gms. per Liter Solution.		Solvent.	Gms. per Liter Solution.	
	(NH <sub>4</sub> ) <sub>2</sub> PtCl <sub>6</sub> .	K <sub>2</sub> PtCl <sub>6</sub> .		(NH <sub>4</sub> ) <sub>2</sub> PtCl <sub>6</sub> .	K <sub>2</sub> PtCl <sub>6</sub> .
55% Alcohol	0.150	...	95% Alcohol	0.0037	0.030
76 " "	0.067	0.026	Abs. " "	...	0.0082-0.0023
85 " "	...	0.180	80 Vol. % Alcohol + 20 Vol. % Ether	...	0.027
90 " "	...	0.100	Abs. Methyl Alcohol	...	0.072

PLATINO AMINES.

SOLUBILITY IN WATER.  
(Cleve.)

Amine.	Formula.	Gms. per 100 Gms. H <sub>2</sub> O.	
Platino Semi Di Amine Chloride	Pt < $\begin{smallmatrix} (NH_2)_2 \cdot Cl \\ Cl \end{smallmatrix}$	0.26 at 0°	3.4 at 100°
Chloro Platin Amine Chloride	Cl <sub>2</sub> Pt < $\begin{smallmatrix} NH_2 \cdot Cl \\ NH_2 \cdot Cl \end{smallmatrix}$	0.14 "	3.0 "
Chloro Platin Semi Diamine Chloride	Cl <sub>2</sub> Pt(NH <sub>2</sub> ) <sub>2</sub> Cl	0.33 "	1.54 "

POTASSIUM ACETATE CH<sub>3</sub>COOK.

SOLUBILITY IN WATER.

100 gms. sat. aq. solution contain 73.65 gms. CH<sub>3</sub>COOK, or 100 gms. H<sub>2</sub>O dissolve 286.3 gms. at 31.25°.

(Köhler — Z. Ver. Zuckerind. 47, 447, '97.)

100 gms. H<sub>2</sub>O dissolve 188 gms. CH<sub>3</sub>COOK at 5°, 229 gms. at 13.9°, 492 gms. at 62°.

(Osann.)

100 gms. 99 per cent ethyl alcohol dissolve 33.3 gms. CH<sub>3</sub>COOK at 15°, and 50.0 gms. at 80°.

POTASSIUM (Di Hydrogen) ARSENATE KH<sub>2</sub>AsO<sub>4</sub>.

100 gms. sat. aq. solution contain 15.9 gms. KH<sub>2</sub>AsO<sub>4</sub>, or 100 gms. H<sub>2</sub>O dissolve 18.86 gms. at 6°. Sp. Gr. of solution = 1.1134.

(Field — J. Ch. Soc. 11, 6, '59.)

POTASSIUM BENZOATE KC<sub>7</sub>H<sub>5</sub>O<sub>2</sub>·3H<sub>2</sub>O.

SOLUBILITY IN WATER.

(Paietta — Gazz. chim. ital. 36, II, 67, '06.)

t°.	17.5°	25°	33.3°	50°
Gms. KC <sub>7</sub> H <sub>5</sub> O <sub>2</sub> , per 100 Gms. Solution.	41.4	42.4	44.0	46.6

SOLUBILITY OF POTASSIUM BORATES IN WATER AT 30°.  
(Dukelski — Z. anorg. Chem. 50, 42, '06, complete references given.)

Gms. per 100 Gms. Solution.		Gms. per 100 Gms. Residue.		Solid Phase.
K <sub>2</sub> O.	B <sub>2</sub> O <sub>3</sub> .	K <sub>2</sub> O.	B <sub>2</sub> O <sub>3</sub> .	
47.50	...	...	...	KOH.2H <sub>2</sub> O
46.36	0.91	46.13	9.02	K <sub>2</sub> O.B <sub>2</sub> O <sub>3</sub> .2½H <sub>2</sub> O
40.51	1.25	41.62	9.71	"
36.82	1.80	39.90	13.19	"
32.74	3.51	37.22	14.58	"
29.63	6.98	35.05	17.92	"
24.84	17.63	30.02	21.70	"
23.30	18.19	26.84	31.49	K <sub>2</sub> O.2B <sub>2</sub> O <sub>3</sub> .4H <sub>2</sub> O
16.21	13.10	25.12	33.18	"
11.78	9.82	20.57	26.43	"
9.18	8.00	22.38	31.30	"
6.22	9.13	20.87	31.06	"
7.73	13.37	22.21	36.24	K <sub>2</sub> O.2B <sub>2</sub> O <sub>3</sub> .4H <sub>2</sub> O + K <sub>2</sub> O.5B <sub>2</sub> O <sub>3</sub> .8H <sub>2</sub> O
7.81	13.28	17.50	34.18	"
7.71	13.21	11.49	34.81	K <sub>2</sub> O.5B <sub>2</sub> O <sub>3</sub> .8H <sub>2</sub> O
7.63	13.28	12.51	40.52	"
3.42	7.59	10.77	37.35	"
1.80	4.15	5.88	20.00	"
0.51	3.19	10.81	40.89	"
0.33	4.58	7.72	34.21	K <sub>2</sub> O.5B <sub>2</sub> O <sub>3</sub> .8H <sub>2</sub> O + B(OH) <sub>3</sub>
0.31	4.46	3.91	30.68	"
...	3.54	...	...	"

POTASSIUM (Fluo) BORIDE KBF<sub>4</sub>.

100 gms. H<sub>2</sub>O dissolve 0.44 gm. KBF<sub>4</sub> at 20°, and 6.27 gms. at 100°.  
(Stolba — Chem. techn. Centr. Anz. 7, 459, '89.)

POTASSIUM BROMATE KBrO<sub>3</sub>.

SOLUBILITY IN WATER.

(Kremers — Pogg. Ann. 97, 5, '56; Rammelsberg — *Ibid.* 55, 79, '42; Pohl — Sitzber. Akad. Wiss. Wien. 6, 595, '51.)

t°.	Gms. KBrO <sub>3</sub> per 100 Gms.		t°.	Gms. KBrO <sub>3</sub> per 100 Gms.	
	Water.	Solution.		Water.	Solution.
0	3.1	3.0	40	13.2	11.7
10	4.8	4.6	50	17.5	14.9
20	6.9	6.5	60	22.7	18.5
25	8.0	7.4	80	34.0	25.4
30	9.5	8.7	100	50.0	33.3

Sp. Gr. of solution saturated at 19.5° = 1.05.

### SOLUBILITY OF POTASSIUM BROMATE IN AQUEOUS SOLUTIONS OF SODIUM NITRATE AND OF SODIUM CHLORIDE.

(Geffcken — Z. physik. Chem. 49, 296, '04.)

In Sodium Nitrate.			In Sodium Chloride.		
Grams per Liter.		Mols. $\text{KBrO}_3$ per Liter.	Grams per Liter.		Mols. $\text{KBrO}_3$ per Liter.
$\text{NaNO}_3$ .	$\text{KBrO}_3$ .		$\text{NaCl}$ .	$\text{KBrO}_3$ .	
0.0	78.79	0.4715	0.0	78.79	0.4715
42.54	96.01	0.5745	29.25	82.24	0.5220
85.09	108.6	0.6497	58.50	93.87	0.5616
170.18	128.3	0.7680	117.0	100.9	0.6042
255.27	150.9	0.9026	175.5	104.3	0.6244
340.36	172.3	1.031	234.0	106.9	0.6400

### POTASSIUM BROMIDE $\text{KBr}$ .

#### SOLUBILITY IN WATER.

(Average curve from results of Meusser — Z. anorg. Chem. 44, 79, '05; Etard — Compt. rend. 98, 1432, '84; Ann. chim. phys. [7] 2, 526, '04; de Coppet — *Ibid.* [5] 30, 416, '83; Tilden and Shenstone — Phil. Trans. 175, 23, '84.)

$t^\circ$ .	Grams $\text{KBr}$ per 100 Grams		$t^\circ$ .	Grams $\text{KBr}$ per 100 Grams	
	Solution.	Water.		Solution.	Water.
— 6.5	20.0	25.0	30	41.4	70.6
— 8.5	26.5	35.7	40	43.0	75.5
— 10.5	29.5	41.8	50	44.5	80.2
— 11.5	31.2	45.3	60	46.1	85.5
— 10	31.8	46.7	70	47.4	90.0
— 5	33.3	50.0	80	48.7	95.0
0	34.9	53.5	90	49.8	99.2
5	36.1	56.5	100	51.0	104.0
10	37.3	59.5	110	52.3	109.5
15	38.5	62.5	140	54.7	120.9
20	39.5	65.2	181	59.3	145.6
25	40.4	67.7			

### SOLUBILITY OF MIXTURES OF POTASSIUM BROMIDE AND AMMONIUM BROMIDE IN WATER AT $25^\circ$ .

(Fock — Z. Kryst. Min. 28, 357, '97.)

Grams per Liter Solution.		Mol. per cent in Solution.		Sp. Gr. of Solutions.	Mol. per cent in Solid Phase	
$\text{NH}_4\text{Br}$ .	$\text{KBr}$ .	$\text{NH}_4\text{Br}$ .	$\text{KBr}$ .		$\text{NH}_4\text{Br}$ .	$\text{KBr}$ .
0.00	558.1	0.0	100	1.3756	0.00	100
6.4	554.2	1.38	98.62	1.3745	0.26	99.74
24.64	536.5	5.29	94.71	1.3733	1.27	98.73
51.34	516.8	10.77	89.23	1.3721	3.02	96.98
152.9	441.2	29.63	70.37	1.3711	8.42	91.58
262.2	347.3	47.84	52.16	1.3715	17.20	82.80
347.6	262.3	61.69	38.31	1.3753	27.98	72.02
381.4	260.3	64.03	35.97	1.3753	32.53	67.47
417.8	232.2	68.61	31.39	1.3766	39.45	60.55
432.5	222.3	70.27	29.73	1.3777	variable	variable
480.8	179.9	76.47	23.53	1.3766	98.53	1.47
577.3	0.0	100.0	0.0	1.3763	100.0	0.00

# POTASSIUM BROMIDE

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## SOLUBILITY OF POTASSIUM BROMIDE IN AQUEOUS SOLUTIONS OF POTASSIUM HYDROXIDE.

(Ditte — Compt. rend. 124, 30, '97.)

Grams per 1000 Grams H <sub>2</sub> O.		Grams per 1000 Grams H <sub>2</sub> O.	
KOH.	KBr.	KOH.	KBr.
36.4	558.4	277.6	248.1
113.5	433.6	434.7	137.1
177.2	358.1	579.6	64.8
231.1	281.2	806.9	33.4

## SOLUBILITY OF MIXTURES OF POTASSIUM BROMIDE AND CHLORIDE AND OF MIXTURES OF POTASSIUM BROMIDE AND IODIDE IN WATER.

(Etard — Ann. chim. phys. [7] 3, 275, '97.)

### Mixtures of KBr and KCl.

### Mixtures of KBr and KI.

t°.	Grams per 100 Gms. Solution.		Grams per 100 Grams Solution.	
	KBr.	KCl.	KBr.	KI.
-20	17.5	10.5	9.2	42.5
0	21.5	10.8	9.9	45.3
10	23.2	11.0	10.2	46.6
20	24.8	11.2	10.5	47.5
25	25.5	11.3	10.7	48.0
30	26.3	11.4	10.9	48.6
40	28.0	11.5	11.2	49.6
60	30.6	11.8	11.9	51.3
80	33.4	12.1	12.6	52.7
100	35.7	12.6	13.2	53.8
120	38.0	12.9	14.0	54.8
150	40.6	13.4	14.9	55.5

## SOLUBILITY OF POTASSIUM BROMIDE IN AQUEOUS SOLUTIONS OF POTASSIUM CHLORIDE, AND OF POTASSIUM CHLORIDE IN AQUEOUS SOLUTIONS OF POTASSIUM BROMIDE, AT 25.2°.

(Touren — Compt. rend. 130, 1252, '00.)

### KBr in Aq. KCl Solutions.

### KCl in Aq. KBr Solutions.

Mols. per Liter.		Grams per Liter.		Mols. per Liter.		Grams per Liter.	
KCl.	KBr.	KCl.	KBr.	KBr.	KCl.	KBr.	KCl.
0.0	4.761	0.0	567.0	0.0	4.18	0.00	311.8
0.67	4.22	50.0	502.5	0.49	3.85	58.4	287.2
0.81	4.15	60.4	494.2	0.85	3.58	101.3	267.1
1.35	3.70	100.7	440.7	1.31	3.19	156.1	238.0
1.48	3.54	110.4	421.6	1.78	2.91	211.9	217.1
1.61	3.42	120.0	407.2	2.25	2.58	268.0	192.4
1.70	3.34	126.8	397.7	2.69	2.33	320.4	173.8
2.46	2.50	183.5	297.7				
3.775	0.525	281.6	625.3				

SOLUBILITY OF POTASSIUM BROMIDE IN AQUEOUS SOLUTIONS OF POTASSIUM NITRATE, AND OF POTASSIUM NITRATE IN AQUEOUS SOLUTIONS OF POTASSIUM BROMIDE, AT 14.5° AND AT 25.2°.

(Touren — Compt. rend. 130, 908, '00.)

KBr in Aqueous KNO<sub>3</sub> Solutions.

KNO<sub>3</sub> in Aq. KBr Solutions.

Mols. per Liter.		Grams per Liter.		Mols. per Liter.		Grams per Liter.	
KNO <sub>3</sub> .	KBr.	KNO <sub>3</sub> .	KBr.	KBr.	KNO <sub>3</sub> .	KBr.	KNO <sub>3</sub> .
Results at 14.3°.				Results at 14.20°.			
0.0	4.332	0.0	515.9	0.0	2.228	0.0	225.4
0.362	4.156	36.6	494.9	0.356	2.026	42.4	205.0
0.706	4.093	71.4	487.4	0.784	1.835	93.4	185.7
1.235	3.939	124.9	469.1	1.092	1.730	130.0	175.0
				1.577	1.587	187.8	160.6
				2.542	1.406	302.7	142.2
				3.536	1.308	421.1	132.3
Results at 25.2°.				Results at 25.2°.			
0.0	4.761	0.0	566.2	0.0	3.217	0.0	325.5
0.131	4.72	13.3	561.0	0.38	3.026	45.3	306.2
0.527	4.61	53.3	549.1	0.93	2.689	110.8	272.0
0.721	4.54	72.9	540.8	1.37	2.492	163.1	252.2
1.09	4.475	110.3	533.0	1.208	2.216	143.8	224.3
1.170	4.44	118.4	528.8	2.87	1.958	341.8	198.1
1.504	4.375	152.2	521.1	3.55	1.807	422.8	182.8

SOLUBILITY OF POTASSIUM BROMIDE IN ALCOHOLS AT 25°.

(de Bruyn — Z. physik. Chem. 10, 783, '92; Rohland — Z. anorg. Chem. 18, 327, '98.)

Alcohol.	Grams KBr Dissolved by 100 Gms. Alcohol at:	
	Room Temp. (R.).	25° (de B.).
Methyl Alcohol	1.92	1.51 Abs. Alcohol
Ethyl Alcohol	0.28 (Sp. Gr. 0.81)	0.13 "
Propyl Alcohol	0.055	...

SOLUBILITY OF POTASSIUM BROMIDE IN AQUEOUS ALCOHOL.

(Taylor — J. Physic. Ch. 1, 724, '96-'97.)

Wt. per cent Alcohol in Solution.	Results at 30°.		Results at 40°.	
	Gms. KBr per 100 Gms. Sat. Solution.	Solvent.	Gms. KBr per 100 Gms. Sat. Solution.	Solvent.
0	41.62	71.30	43.40	76.65
5	38.98	67.25	40.85	72.70
10	36.33	63.40	38.37	69.00
20	31.09	56.40	33.27	62.30
30	25.98	50.15	28.32	56.45
40	21.24	44.95	23.22	50.46
50	16.27	38.85	18.11	44.25
60	11.50	32.50	13.02	37.40
70	6.90	24.70	7.98	28.90
80	3.09	15.95	3.65	18.95
90	0.87	8.80	1.03	10.45

100 gm. acetone dissolve 0.023 gm. KBr at 25°.

(Krug and McElroy — J. anal. Chem. 6, 184, '92.)



SOLUBILITY OF POTASSIUM BROMIDE AT 25° IN:  
(Herz and Knoch — Z. anorg. Chem. 45, 262, '05.)

Aqueous Acetone.					Aqueous Glycerine.				
cc. Acetone per 100 cc. Solvent.	Per 100 cc. Sat. Solution.			Sp. Gr. Solutions.	Wt. % Glycerine in Solvent.	KBr per 100 cc. Sol.		Sp. Gr. Solutions	
	Millimols KBr.	Gms. KBr.	Gms. H <sub>2</sub> O.			Millimols.	Gms.		
0	481.3	57.3	80.6	1.3793	0	481.3	57.32	1.3793	
20	366.7	43.67	69.5	1.2688	13.28	444.3	52.91	1.3704	
30	310.5	36.98	62.97	1.2118	25.98	404.0	48.11	1.3655	
40	259.0	30.85	55.60	1.1558	45.36	340.5	40.55	1.3594	
50	202.9	24.16	47.60	1.0918	54.23	310.4	36.98	1.3580	
60	144.9	17.22	39.15	1.0275	83.84	219.25	26.11	1.3603	
70	95.3	11.35	29.78	0.9591	100.00	172.65	20.56	1.3691	
80	46.5	5.54	20.10	0.8942					
90	10.1	1.20	10.15	0.8340					

100 cc. sat. solution of potassium bromide in furfural (C<sub>4</sub>H<sub>3</sub>O.CO.H) contain 0.139 gm. KBr at 25°.

(Walden — Z. physik. Chem. 55, 713, '06.)

POTASSIUM BUTYRATE C<sub>3</sub>H<sub>7</sub>COOK.

100 grams water dissolve 296.8 grams C<sub>3</sub>H<sub>7</sub>COOK, or 100 grams sat. solution contain 74.8 grams at 31.25°.

100 grams of an aq. solution saturated with sugar and C<sub>3</sub>H<sub>7</sub>COOK contain 49.19 grams sugar + 34.78 grams C<sub>3</sub>H<sub>7</sub>COOK + 16.03 grams H<sub>2</sub>O at 31.25°.

(Köhler — Z. Ver. Zuckerind. 47, 447, '97.)

POTASSIUM CARBONATE K<sub>2</sub>CO<sub>3</sub>.

POTASSIUM (Bi) CARBONATE KHCO<sub>3</sub>.

SOLUBILITY OF EACH IN WATER.

(Mulder; Dibbitts — J. pr. Chem. [2] 10, 439, '74.)

t°.	Grams K <sub>2</sub> CO <sub>3</sub> per 100 Grams		Grams KHCO <sub>3</sub> per 100 Grams	
	Solution.	Water.	Solution.	Water.
0	47.2	89.4	18.3	22.4
10	52.2	109.0	21.7	27.7
20	52.8	112.0	24.9	33.2
30	53.3	114.0	28.1	39.0
40	54.0	117.0	31.2	45.3
60	56.0	127.0	37.5	60.0
100	60.9	156.0		

Köhler (loc. cit.) gives for the solubility of K<sub>2</sub>CO<sub>3</sub> in water, 48.91 grams K<sub>2</sub>CO<sub>3</sub> per 100 grams solution, or 95.9 grams per 100 grams H<sub>2</sub>O at 31.25°. In saturated sugar solution at the same temperature he finds 56.0 grams sugar + 22.24 grams K<sub>2</sub>CO<sub>3</sub> + 21.76 grams H<sub>2</sub>O per 100 grams sat. solution. Engel (Ann. chim. phys. [6] 13, 366, '88) finds 111.0 grams K<sub>2</sub>CO<sub>3</sub> per 100 grams H<sub>2</sub>O or 52.6 grams per 100 grams sat. solution at 0°. Sp. Gr. of solution = 1.542. For potassium bi carbonate he finds 23 grams KHCO<sub>3</sub> per 100 grams H<sub>2</sub>O, or 18.7 grams per 100 grams solution. Sp. Gr. of solution = 1.127.

239 **POTASSIUM CARBONATE****SOLUBILITY OF POTASSIUM BI CARBONATE IN AQUEOUS SOLUTIONS OF POTASSIUM CARBONATE AT 0°.**

(Engel.)

Milligram Mols. per 10 cc. Solution.		Sp. Gr. of Solutions.	Grams per 100 cc. Solution.	
$\frac{1}{2}$ K <sub>2</sub> CO <sub>3</sub> .	KHCO <sub>3</sub> .		K <sub>2</sub> CO <sub>3</sub> .	KHCO <sub>3</sub> .
0.0	21.15	1.133	0.0	21.2
17.14	15.28	1.182	11.8	15.3
24.10	12.65	1.203	16.7	12.6
34.50	10.25	1.241	23.8	10.3
49.20	7.55	1.298	34.0	7.6
62.14	5.86	1.350	43.0	5.9
74.60	4.90	1.398	51.6	4.9
87.50	3.75	1.448	60.5	3.8
117.75	0.0	1.542	81.4	0.0

**SOLUBILITY OF POTASSIUM CARBONATE IN AQUEOUS SOLUTIONS OF ETHYL AND PROPYL ALCOHOLS AT 20°.**

(Linebarger — Am. Ch. J. 14, 380, '92; de Bruyn — Rec. trav. chim. 18, 87, '99.)

In Aq. Ethyl Alcohol.				In Aq. Propyl Alcohol.	
Wt. per cent C <sub>2</sub> H <sub>5</sub> OH in Solvent.	Gms. K <sub>2</sub> CO <sub>3</sub> per 100 Gms. Sat. Solution.	Wt. per cent C <sub>2</sub> H <sub>5</sub> OH in Solvent.	Gms. K <sub>2</sub> CO <sub>3</sub> per 100 Gms. Sat. Solution.	Wt. per cent C <sub>3</sub> H <sub>7</sub> OH in Solvent.	Gms. K <sub>2</sub> CO <sub>3</sub> per 100 Gms. Sat. Solution.
10	24	50	2.5	40	4.3
20	16	55	1.8	45	3.0
30	10	60	1.1	50	2.0
40	5.6	65	0.8	55	1.3
45	4	69	0.4	60	0.8
				65	0.5

100 grams glycerine of 1.225 Sp. Gr. dissolve 7.4 grams K<sub>2</sub>CO<sub>3</sub>.

(Vogel — N. Rep. Pharm. 16, 557, '67.)

**POTASSIUM SODIUM CARBONATE KNaCO<sub>3</sub>·6H<sub>2</sub>O.**100 gms. H<sub>2</sub>O dissolve 184 gms. salt at 15°. Sp. Gr. of sol. = 1.366.

(Stolba — J. pr. Chem. 94, 406, '65.)

**POTASSIUM URANYL CARBONATE 2K<sub>2</sub>CO<sub>3</sub>·(UO<sub>2</sub>)CO<sub>3</sub>.**100 gms. H<sub>2</sub>O dissolve 7.4 gms. salt at 15°.

(Ebelmen — Liebig's Ann. [3] 5, 189, '52.)

**POTASSIUM CHLORATE KClO<sub>3</sub>.****SOLUBILITY IN WATER.**

(Gay-Lussac — Ann. chim. phys. 11, 314, 1819; Pawlewski — Ber. 32, 1040, '99; above 100°, Tilden and Shenstone — Proc. Roy. Soc. 35, 345, '81; see also Blarez — Compt. rend. 112, 1213, '91; Etard — Ann. chim. phys. [7] 2, 526, 94; at 99°, Köhler — Z. anal. Chem. 18, 242, '79.)

t°.	Gms. KClO <sub>3</sub> per 100 Gms.			t°.	Gms. KClO <sub>3</sub> per 100 Gms.		
	Solution.	Water.			Solution.	Water.	
0	3.04	3.14	3.3*	70	22.55	29.16	32.5*
10	4.27	4.45	5.0	80	26.97	36.93	39.6
20	6.76	7.22	7.1	90	31.36	46.11	47.5
25	7.56	8.17	8.6	100	35.83	55.54	56.0
30	8.46	9.26	10.1	120	42.4	73.7	73.7
40	11.75	13.31	14.5	136	49.7	98.5	99.0
50	15.18	17.95	19.7	190	64.6	183.0	183.0
60	18.97	23.42	26.0	330	96.7	2930.00	...

\* Gay Lussac.

# **POTASSIUM CHLORATE** 240

## **SOLUBILITY OF POTASSIUM CHLORATE IN AQUEOUS SOLUTIONS OF POTASSIUM BROMIDE AT 13°.**

(Blarez — Compt. rend. 112, 1213, '91.)

Gms. per 100 Gms. Solution.		Gms. per 100 Gms. Solution.		Gms. per 100 Gms. Solution.	
KBr.	KClO <sub>3</sub> .	KBr.	KClO <sub>3</sub> .	KBr.	KClO <sub>3</sub> .
0.20	5.18	1.0	5.04	6.0	3.46
0.60	5.20	2.0	4.60	8.0	2.80
0.8	5.06	3.0	4.2	10.0	2.40
		4.0	4.0		

## **SOLUBILITY OF POTASSIUM CHLORATE IN AQUEOUS SOLUTIONS OF OTHER POTASSIUM SALTS AT 14°-15°.**

(Blarez.)

Salt.	Gms. per 100 Gms. Solution.		Salt.	Gms. per 100 Gms. Solution.	
	K Salt.	KClO <sub>3</sub> .		K Salt.	KClO <sub>3</sub> .
KOH	1.43	4.47	KNO <sub>3</sub>	2.59	4.51
KCl	1.91	4.45	"	5.18	3.88
"	3.82	3.58	K <sub>2</sub> SO <sub>4</sub>	2.23	4.71
KBr	3.05	4.49	"	4.46	3.98
"	6.10	3.60	K <sub>2</sub> C <sub>2</sub> O <sub>4</sub>	2.42	4.72
KI	4.25	4.59	"	4.85	3.93
"	8.51	3.65			

## **SOLUBILITY OF POTASSIUM CHLORATE IN AQUEOUS SOLUTIONS OF POTASSIUM CHLORIDE AT 20°.**

(Winteler — Z. Electrochem. 7, 360, '00.)

Sp. Gr. of Solutions.	Grams per Liter.		Sp. Gr. of Solutions.	Grams per Liter.	
	KCl.	KClO <sub>3</sub> .		KCl.	KClO <sub>3</sub> .
1.050	0	71.1	1.098	120	24.5
1.050	10	58.0	1.108	140	22.5
1.050	20	49.0	1.119	160	21.0
1.054	40	39.5	1.130	180	20.0
1.064	60	34.0	1.140	200	20.0
1.075	80	30.0	1.168	250	20.0
1.086	100	27.0			

## **SOLUBILITY OF POTASSIUM CHLORATE IN AQUEOUS SOLUTIONS OF POTASSIUM NITRATE.**

(Arrhenius — Z. physik. Chem. 11, 397, '93.)

Results at 19.85°.

Results at 23.87°.

Mols. per Liter.		Grams per Liter.		Mols. per Liter.		Grams per Liter.	
KNO <sub>3</sub> .	KClO <sub>3</sub> .	KNO <sub>3</sub> .	KClO <sub>3</sub> .	KNO <sub>3</sub> .	KClO <sub>3</sub> .	KNO <sub>3</sub> .	KClO <sub>3</sub> .
0.0	0.570	0.0	69.88	0.0	0.645	0.0	79.09
0.125	0.529	12.65	64.86	0.5	0.515	50.59	63.14
0.25	0.492	25.29	60.33				
1.0	0.374	101.19	45.85				
2.0	0.328	202.38	40.22				

## SOLUBILITY OF POTASSIUM CHLORATE:

(Taylor — J. Physic. Chem. 2, 720, '96-'97; see also Gerardin — Ann. chim. phys. [4] 5, 148, '65.)

Wt. per cent Alcohol or of Acetone in Solvent.	In Aqueous Alcohol.				In Aqueous Acetone.			
	At 30°.		At 40°.		At 30°.		At 40°.	
	Gms. KClO <sub>3</sub> per 100 Gms.	Gms. KClO <sub>3</sub> per 100 Gms.	Gms. KClO <sub>3</sub> per 100 Gms.	Gms. KClO <sub>3</sub> per 100 Gms.	Gms. KClO <sub>3</sub> per 100 Gms.	Gms. KClO <sub>3</sub> per 100 Gms.	Gms. KClO <sub>3</sub> per 100 Gms.	Gms. KClO <sub>3</sub> per 100 Gms.
	Solution.	Water.	Solution.	Water.	Solution.	Water.	Solution.	Water.
0	9.23	10.17	12.23	13.93	9.23	10.17	11.23	13.93
5	7.72	8.80	10.48	12.33	8.32	9.56	11.10	13.11
10	6.44	7.65	8.84	10.77	7.63*	9.09	10.28*	12.60
20	4.51	5.90	6.40	8.56	6.09	8.10	8.27	11.26
30	3.21	4.74	4.67	7.00	4.93	7.40	6.69	10.24
40	2.35	4.00	3.41	5.88	3.90	6.76	5.36	9.45
50	1.64	3.33	2.41	4.94	2.90	5.98	4.03	8.40
60	1.01	2.53	1.41	3.69	2.03	5.17	2.86	7.35
70	0.54	1.82	0.78	2.63	1.24	4.18	1.68	5.68
80	0.24	1.22	0.34	1.73	0.57	2.88	0.79	3.97
90	0.06	0.62	0.12	1.17	0.18	1.82	0.24	2.45

\* Solvent, 9.09 Wt. per cent Acetone.

100 grams glycerine dissolve 3.5 grams KClO<sub>3</sub> at 15.5°.100 grams sat. solution of KClO<sub>3</sub> in glycol contain 0.9 gram KClO<sub>3</sub>.

(de Coninck — Bul. acad. roy. Belgique, 359, '05.)

POTASSIUM (Per) CHLORATE KClO<sub>4</sub>.

## SOLUBILITY IN WATER AND IN ALCOHOL.

(Muir — Chem. News, 33, 15, '76; Wenzel — Z. angew. Ch. 5, 691, '91.)

In Water. (M.)			In Alcohol. (W.)	
t°.	Gms. KClO <sub>4</sub> per 100 Gms. H <sub>2</sub> O.	Sp. Gr. of Solutions.	Wt. per cent Alcohol.	Gms. KClO <sub>4</sub> per 100 Gms. Alcohol.
6	0.7	1.0005	97.2	0.0156
25	1.9	1.0123	95.8	0.020
50	6.45	1.0181	90.0	0.036
100	20.0	1.0660		

## POTASSIUM CHLORIDE KCl.

## SOLUBILITY IN WATER.

(Average curve from the results of Meusser — Z. anorg. Chem. 44, 70, '05; at 31.25°, Köhler — Z. Ver. Zuckerind. 47, 447, '97; Andrae — J. pr. Chem. [2] 29, 456, '84; Gerardin — Ann. chim. phys. [4] 5, 137, '65; de Coppet *Ibid.* [5] 30, 411, '83; Etard *Ibid.* [7] 2, 526, '94; Mulder; above 100°, Tilden and Shenstone — Proc. Roy. Soc. (Lond.) 35, 345, '83.)

t°.	Gms. KCl per 100 Gms.		t°.	Gms. KCl per 100 Gms.		t°.	Gms. KCl per 100 Gms.	
	Solution.	Water.		Solution.	Water.		Solution.	Water.
-9	19.3	23.9	40	28.6	40.0	147	41.5	70.8
-4.5	20.6	25.9	50	29.9	42.6	180	43.7	77.5
0	21.6	27.6	60	31.3	45.5		Solid Phase Ice	
5	22.7	29.3	70	32.6	48.3	-9	19.3	23.9
10	23.7	31.0	80	33.8	51.1	-8	17.7	21.5
15	24.5	32.4	90	35.1	54.0	-8	16.7	20.0
20	25.4	34.0	100	36.2	56.7	-7	14.9	17.5
25	26.2	35.5	130	39.8	66.0	-6	13.6	15.7
30	27.1	37.0				-5.5	12.5	14.3

Sp. Gr. of solution sat. at 0 = 1.150; at 15° = 1.172.

# POTASSIUM CHLORIDE

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## SOLUBILITY OF MIXTURES OF POTASSIUM CHLORIDE AND AMMONIUM CHLORIDE IN WATER AT 25°.

(Fock — Z. Kryst. Min. 28, 353, '97.)

Grams per Liter Solution.		Mol. per cent in Solution.		Sp. Gr. of Solutions.	Mol. per cent in Solid Phase.	
NH <sub>4</sub> Cl.	KCl.	NH <sub>4</sub> Cl.	KCl.		NH <sub>4</sub> Cl.	KCl.
0.00	311.3	0.00	100.0	1.1807	0.0	100
22.81	293.3	9.41	90.59	1.1716	1.21	98.79
35.39	278.7	15.04	84.96	1.1678	2.11	97.89
89.17	273.2	34.26	65.74	1.1591	6.18	93.82
127.8	234.6	46.59	53.44	1.1493	8.90	91.10
147.2	204.2	51.63	48.37	1.1461	10.53	89.47
197.3	157.7	63.56	36.44	1.1391	17.86	82.14
232.5	116.8	73.49	26.51	1.1326	60.20	39.80
244.5	123.0	73.48	26.52	1.1329	76.88	23.12
261.9	111.0	79.10	20.90	1.1245	97.51	2.49
259.0	102.2	82.14	17.86	1.1212	97.79	2.21
278.6	53.16	87.96	12.04	1.1009	98.85	1.15
320.7	31.24	93.45	6.55	1.0912	99.33	0.67
273.5	0.00	100.00	0.00	1.0768	100.0	0.00

## SOLUBILITY OF MIXTURES OF POTASSIUM CHLORIDE AND POTASSIUM BROMIDE AT 25°.

(Fock.)

Grams per Liter Solution.		Milligram Mols. per Liter.		Mol. per cent KCl in Solution.	Sp. Gr. of Solutions.	Mol. per cent KCl in Solid Phase.
KBr.	KCl.	KBr.	KCl.			
558.1	0.00	4686.2	0.0	0.0	1.3756	0.00
531.5	23.44	4462.7	314.2	6.16	1.3700	0.00
503.6	46.57	4228.5	624.3	12.86	1.3648	8.23
454.6	82.62	3817.8	1108.0	22.49	1.3544	15.68
379.6	136.6	3188.1	1830.7	36.48	1.3320	33.66
324.8	166.9	2727.6	2237.4	45.06	1.3119	63.51
218.0	213.9	1830.2	2868.0	60.30	1.2689	82.29
140.7	250.9	1181.1	3363.9	74.01	1.2455	88.04
47.5	291.7	398.8	3911.4	85.22	1.1977	96.98
0.0	311.3	0.0	4173.1	100.00	1.1756	100.00

## SOLUBILITY OF POTASSIUM CHLORIDE IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID AT 0°.

(Jeannel — Compt. rend. 103, 381, '86; Engel — Ann. chim. phys. [6] 13, 377, '88.)

Milligram Mols. per 10 cc.		Grams per 100 cc. Solution.		Sp. Gr. of Solutions.
KCl.	HCl.	KCl.	HCl.	
34.5	0.0	25.73	0.0	1.159
30.41	3.9	22.69	1.42	1.152
27.95	6.6	20.84	2.41	1.150
27.5	7.1	20.51	2.59	1.147
23.75	11.1	17.71	4.05	1.137
16.0	23.0	11.93	8.39	1.111
10.0	34.0	7.46	12.40	1.105
7.5	41.0	5.60	14.95	1.105
2.0	65.5	1.49	23.88	1.121
2.4	148.8 (sat.)	1.52	54.26	1.224

100 cc. saturated HCl solution dissolve 1.9 grams KCl at 17°.

(Ditte — Compt. rend. 92, 242, '86.)

**SOLUBILITY OF POTASSIUM CHLORIDE IN AQUEOUS POTASSIUM HYDROXIDE SOLUTIONS.**

(Engel — Bull. soc. chim. [3] 6, 16, '91; Winteler — Z. Electrochem. 7, 360, '00.)

Results at 0°.					Results at 20°.		
(Engel.)					(Winteler.)		
Mg. Mols. per 10 cc. Solution		Sp. Gr. of Solution.	Gms. per 100 cc. Solution.		Gms. per 100 cc. Solution.		Sp. Gr. of Solution.
KCl.	KOH.		KCl.	KOH.	KCl.	KOH.	
35.5	0	1.159	26.83	0.0	29.3	1.0	1.185
31.0	2.375	1.146	23.44	1.33	21.1	10.0	1.210
28.3	4.7	1.153	21.39	2.64	14.8	20.0	1.245
23.0	9.9	1.172	17.39	5.56	10.4	30.0	1.295
18.38	15.1	1.195	13.89	8.46	6.8	40.0	1.345
14.43	20.0	1.216	10.91	11.23	4.0	50.0	1.397
11.43	24.63	1.239	8.64	13.83	2.2	60.0	1.450
8.98	29.25	1.261	6.78	16.43	1.4	70.0	1.500
6.28	35.13	1.294	4.74	19.72	1.1	80.0	1.550
					0.9	85.0	1.580

**SOLUBILITY OF MIXTURES OF POTASSIUM CHLORIDE AND POTASSIUM IODIDE IN WATER.**

(Etard — Ann. chim. phys. [7] 3, 275, '94.)

t°.	Grams per 100 Gms. Solution.		t°.	Grams per 100 Gms. Solution.	
	KCl.	KI.		KCl.	KI.
0	3.7	50.5	100	6.2	61.0
20	4.2	53.0	140	7.3	63.7
40	4.7	55.3	180	8.3	65.5
60	5.2	57.5	220	9.4	66.3
80	5.7	59.4	245	10.0	66.5

**SOLUBILITY OF POTASSIUM CHLORIDE IN AQUEOUS MAGNESIUM CHLORIDE SOLUTIONS.**

(Precht and Wittgen — Ber. 14, 1667, '81.)

t°.	Grams KCl per 100 Grams Sat. Solution in:				
	11% MgCl <sub>2</sub> .	15% MgCl <sub>2</sub> .	21.2% MgCl <sub>2</sub> .	30% MgCl <sub>2</sub> .	20% MgCl <sub>2</sub> .
10	14.3	9.9	5.3	1.9	4.2 KCl + 5.7 NaCl
20	15.9	11.3	6.5	2.6	6.0 " + 5.9 "
30	17.5	12.7	7.6	3.4	6.9 " + 6.0 "
40	19.0	14.2	8.8	4.2	7.9 " + 6.1 "
50	20.5	15.6	10.0	5.0	8.9 " + 6.3 "
60	21.9	17.0	11.2	5.8	9.9 " + 6.4 "
80	24.5	19.5	13.6	7.3	10.9 " + 6.6 "
90	25.8	20.8	14.7	8.1	11.9 " + 6.7 "
100	27.1	22.1	15.9	8.9	13.0 " + 6.9 "

**POTASSIUM CHLORIDE** 244

SOLUBILITY OF POTASSIUM CHLORIDE IN AQUEOUS SOLUTIONS OF POTASSIUM NITRATE, AND OF POTASSIUM NITRATE IN AQUEOUS SOLUTIONS OF POTASSIUM CHLORIDE, AT SEVERAL TEMPERATURES.

(Touren — Compt. rend. 130, 908, '00; Bodländer — Z. physik. Ch. 7, 360, '91; Nicol — Phil. Mag. (Lond.) 31, 369, '91; Soch — J. Physic. Ch. 2, 46, '98.)

KCl in Aq. KNO<sub>3</sub> Solutions at:

14.5° (T.).		17.5° (B.).		25.2° (T.).		20°, etc. (N.).	
Gms. per Liter Solution.		Sp. Gr. Solutions.	Gms. per Liter.		Gms. per Liter.		Gms. per 1000 Gms. H <sub>2</sub> O.
KNO <sub>3</sub> .	KCl.		KNO <sub>3</sub> .	KCl.	KNO <sub>3</sub> .	KCl.	
0	288.3	1.173	0.0	293.9	0.0	311.8	0.00 345.2
20.64	284.2	1.198	65.8	275.0	13.76	306.6	56.18 342.15
32.18	282.1	1.210	88.3	273.4	32.18	303.6	168.54 334.39
62.23	276.8	1.225	124.8	265.3	91.26	293.2	at 25°
82.77	273.5	1.236	148.3	259.8	122.7	287.2	225.8 341.3
115.9	270.7	1.239	152.2	259.6	141.4	284.2	at 80°
119.1	268.3	1.239	154.9	259.5	182.7	276.0	1175.0 402.0
123.4	267.2	1.241	153.3	262.4			

KNO<sub>3</sub> in Aq. KCl Solutions at:

14.5°.		25.2°.		20°.	
Grams per Liter Solution.		Grams per Liter Solution.		Grams per 1000 Gms. H <sub>2</sub> O.	
KCl.	KNO <sub>3</sub> .	KCl.	KNO <sub>3</sub> .	KCl.	KNO <sub>3</sub> .
0.0	225.4	0.0	325.5	0.0	311.1
13.58	219.8	19.39	312.3	82.9	256.8
31.63	208.2	49.22	288.7	165.8	221.7
65.64	185.2	100.7	254.0	248.7	202.0
132.6	159.5	155.2	224.4	310.8	501.6
164.4	153.3	207.3	203.9		
196.5	144.0	226.8	196.9		
236.9	137.1				

KNO<sub>3</sub> in Aq. KCl at 20.5° (B.).      KCl in Aq. KNO<sub>3</sub> at 20.5° (B.).

Gms. per 100 Gms. Solution.		Sp. Gr. of Solutions.	Gms. per 100 Gms. Solution.		Sp. Gr. of Solutions.
KCl.	KNO <sub>3</sub> .		KNO <sub>3</sub> .	KCl.	
0.0	27.68	1.1625	0.0	29.39	1.1730
4.72	24.39	1.1700	6.58	27.50	1.1980
7.74	22.44	1.1765	8.88	27.34	1.2100
12.23	20.23	1.1895	12.48	26.53	1.2250
15.15	18.96	1.1983	14.83	25.98	1.2360
19.61	17.67	1.2150	15.22	25.96	1.2390
22.17	17.11	1.2265	15.49	25.95	1.2388
24.96	16.79	1.2400	15.33	26.24	1.2410

**SOLUBILITY OF MIXTURES OF POTASSIUM CHLORIDE AND POTASSIUM SULPHATE IN WATER.**

t°.	Gms. per 100 Gms. H <sub>2</sub> O.		Observer.	t°.	Gms. per 100 Gms. H <sub>2</sub> O.		Observer.
	KCl.	+ K <sub>2</sub> SO <sub>4</sub> .			KCl.	+ K <sub>2</sub> SO <sub>4</sub> .	
10	30.9	1.32	(Precht and Wittgen.)	40	38.7	1.68	(P. and W.)
15.8	28.0	2.3	(Kopp.)	50	41.3	1.82	"
20	33.4	1.43	(P. and W.)	60	43.8	1.94	"
25	34.76	2.93	(Van't Hoff and Meyerhoffer.)	80	49.2	2.21	"
30	36.1	1.57	(P. and W.)	100	54.5	2.53	"

**SOLUBILITY OF MIXTURES OF POTASSIUM CHLORIDE AND SODIUM CHLORIDE IN WATER.**

(1) Precht and Wittgen — Ber. 14, 1667, '81; at 25° and at 80°. (3) Soch — J. Physic. Ch. 2, 46, '98;  
(2) Etard — Ann. chim. phys. [7] 3, 275, '97.)

t°.	Grams per 100 Grams H <sub>2</sub> O.				t°.	Grams per 100 Grams H <sub>2</sub> O.			
	KCl.		NaCl.			KCl.		NaCl.	
0	11.2(1)	11.2(2)	30.0(1)	30.0(2)	50	22.0(1)	19.0(2)	27.7(1)	32.3(2)
10	12.5	12.3	29.7	30.5	60	24.6	20.6	27.2	32.8
20	14.7	13.8	29.2	31.0	70	27.3	32.5	26.8	34.1
25	15.8(3)	14.5	29.0(3)	31.3	80	30.0(3)	25.2(3)	26.4(3)	34.0
30	17.2	15.4	28.7	31.5	90	32.9	28.4	26.1	32.3
40	19.5	17.0	28.2	31.9	100	34.7	32.3	25.8	30.6

NOTE. — Page and Keightly, Rudorff and also Nicol, give single determinations which lie nearer the results of Precht and Wittgen than to those of Etard.

**SOLUBILITY OF POTASSIUM CHLORIDE IN AQUEOUS SOLUTIONS OF SODIUM CHLORIDE, AND OF SODIUM CHLORIDE IN AQUEOUS SOLUTIONS OF POTASSIUM CHLORIDE, AT 20°.**

(Nicol — Phil. Mag. (Lond.) 31, 369, '91.)

**KCl in Aq. NaCl Solutions.**

Grams per 100 Grams H <sub>2</sub> O.	
NaCl.	KCl.
0.0	34.52
6.5	29.37
13.0	4.71
19.5	.42

**NaCl in Aq. KCl Solutions.**

Grams per 100 Grams H <sub>2</sub> O.	
KCl.	NaCl.
0.0	35.91
4.14	34.39
8.29	32.71
12.42	31.30

100 gms. 40 per cent by wt. alcohol dissolve 5.87 gms. KCl + 12.25 gms. NaCl at 25°.

100 gms. 40 per cent by wt. alcohol dissolve 5.29 gms. KNO<sub>3</sub> + 10.06 gms. KCl at 25°. (Soch — J. Physic. Ch. 2, 46, '98.)

100 gms. abs. ethyl alcohol dissolve 0.034 gm. KCl at 18.5°.

100 gms. abs. methyl alcohol dissolve 0.5 gm. KCl at 18.5°.

(de Bruyn — Z. physik. Ch. 10, 783, '92; Rohland — Z. anorg. Ch. 18, 327, '98.)



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**SOLUBILITY OF POTASSIUM CHLORIDE IN AQUEOUS ALCOHOL.**  
(Gerardin — Ann. chim. phys. [4] 5, 140, '65.)

Interpolated from the original results.

t°.	Grams KCl per 100 Gms. Aq. Alcohol of Sp. Gr.:							
	0.9904 = 5.5 Wt. %.	0.9848 = 9.35 Wt. %.	0.9793 = 13.6 Wt. %.	0.9726 = 19.1 Wt. %.	0.9573 = 30 Wt. %.	0.939 = 40 Wt. %.	0.8967 = 60 Wt. %.	0.8244 = 90 Wt. %.
0	23.4	19.5	15.5	11.5	7.0	4.0	1.7	0.0
5	25.0	21.0	16.8	12.8	8.0	4.8	2.2	0.0
10	26.4	22.5	18.0	14.0	9.0	5.6	2.7	0.0
15	26.8	24.0	19.2	15.2	10.0	6.4	3.1	0.04
20	29.1	25.3	20.3	16.1	10.8	7.2	3.5	0.06
25	30.4	26.8	21.5	17.1	11.6	7.9	3.9	0.08
30	31.7	28.0	22.6	18.2	12.5	8.5	4.2	0.10
40	34.3	30.8	24.8	20.0	14.0	9.9	4.8	0.20
50	37.0	33.5	27.0	21.8	15.5	10.8	5.2	0.30
60	...	...	...	...	16.8	11.8	5.5	0.40

**SOLUBILITY OF POTASSIUM CHLORIDE IN AQUEOUS ALCOHOL AT:**

15°.

(Schiff — Liebig's Ann. 118, 365, '61.)

14.5°.

(Bodländer — Z. physik. Ch. 7, 316, '91.)

Sp. Gr. of Alcohol.	Wt. per cent Alcohol.	G. KCl per 100 g. Aq. Alcohol.	Sp. Gr. of Sat. Solutions.	Grams per 100 cc. Solution.		
				C <sub>2</sub> H <sub>5</sub> OH.	H <sub>2</sub> O.	KCl.
0.984	10	19.8	1.1720	...	88.10	29.10
0.972	20	14.7	1.1542	2.79	85.78	26.85
0.958	30	10.7	1.1365	4.98	84.00	24.67
0.940	40	7.7	1.1075	10.56	79.63	20.56
0.918	50	5.0	1.1085	15.57	75.24	17.24
0.896	60	2.8	1.0545	20.66	70.52	14.27
0.848	80	0.45	1.0455	24.25	67.05	13.25
Gerardin's results at 15° agree well with the above determinations.			0.9695	40.42	50.18	6.35
			0.9315	48.73	40.60	3.82
			0.8448	68.63	15.55	0.30

30° and 40°.

(Bathrick — J. Physic. Chem. 1, 160, '96.)

Wt. per cent Alcohol.	Gms. KCl per 100 Gms. Aq. Alcohol.		Wt. per cent Alcohol.	Gms. KCl per 100 Gms. Aq. Alcohol.	
	At 30°.	At 40°.		At 30°.	At 40°.
0	38.9	41.8	43.1	11.1	13.1
5.28	33.9	35.9	55.9	6.8	8.2
9.43	30.2	33.3	65.9	3.6	4.1
16.9	24.9	27.6	78.1	1.3	1.0
25.1	19.2	21.8	86.2	0.4	0.5
34.1	15.6	17.2			

## SOLUBILITY OF POTASSIUM CHLORIDE IN AQUEOUS ACETONE SOLUTIONS.

(Snell — J. Physic. Ch. 2, 484, '98; at 20°, Herz and Knoch — Z. anorg. Ch. 41, 317, '04.)

Per cent Acetone in Solvent.	At 20°.		At 30°.		At 40°.		At 50°.	
	KCl per 100 cc. Solution.	Gms.	Gms. per 100 Gms. Solution.	Gms.	Gms. per 100 Gms. Solution.	Gms.	Gms. per 100 Gms. Solution.	Gms.
	Millimols.		Acetone.	KCl.	Acetone.	KCl.	Acetone.	KCl.
0	410.5	30.62	0.0	27.27	0.0	28.69	0.0	30.0
9.1	351.7	26.23	6.96	23.42	6.79	25.33	...	...
20	286.6	21.38	16.22	18.90	15.75	21.28	...	...
30	223.7	16.69	25.45	15.06	two layers		25.67	14.42
40	166.5	12.42	35.52	11.31	"		36.03	9.93
50	115.4	8.61	45.98	8.04	"		46.46	7.07
60	71.2	5.31	56.91	5.12	"		57.37	4.38
70	38.5	2.87	68.18	2.60	"		68.56	2.22
80	12.9	0.96	78.43	0.76	79.34	0.58	79.25	0.94
90	2.0	0.15	89.88	0.13	89.84	0.16	81° + sat. sol.	
100	0.0	0.0	100.0	0.00	100.00	0.00		

NOTE. — For the 20° results the per cent acetone in the solvent is stated in terms of volume per cent, and the concentration of the second solution is 10 per cent instead of 9.1 which is the concentration of the solvent for the corresponding results at the other temperatures.

AT THE TEMPERATURE 40° AND FOR CONCENTRATIONS OF ACETONE BETWEEN 20 AND 80 PER CENT THE SATURATED SOLUTION SEPARATES INTO TWO LAYERS HAVING THE FOLLOWING COMPOSITIONS:

## Upper Layer.

Grams per 100 Grams Solution.		
H <sub>2</sub> O.	(CH <sub>3</sub> ) <sub>2</sub> CO.	KCl.
55.2	31.82	12.99
53.27	35.44	11.29
51.23	48.50	10.27
50.3+	39.88	9.77
48.02	43.18	8.79
46.49	45.34	8.17
58.99	25.24	15.77

## Lower Layer.

Grams per 100 Grams Solution.		
H <sub>2</sub> O.	(CH <sub>3</sub> ) <sub>2</sub> CO.	KCl.
28.14	69.42	2.44
30.96	65.97	3.07
32.64	63.79	3.56
34.07	62.01	3.92
37.44	57.67	4.89
38.68	56.17	5.25
23.66	74.91	1.43

100 cc. sat. solution of potassium chloride in furfural (C<sub>4</sub>H<sub>3</sub>O.CO.H) contain 0.085 gm. KCl at 25°.

(Walden — Z. physik. Ch. 55, 713, '06.)

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## **SOLUBILITY OF POTASSIUM CHLORIDE IN AQUEOUS SOLUTIONS OF GLYCERINE AT 25°.**

(Herz and Knoch — Z. anorg. Ch. 45, 267, '05.)

Sp. Gr. of Glycerine at 25°/4° = 1.2555. Impurity about 1.5%.

Wt. per cent Glycerine in Solvent.	KCl per 100 cc. Solution.		Sp. Gr. of Solutions.	Wt. per cent Glycerine in Solvent.	KCl per 100 cc. Solution.		Sp. Gr. of Solutions.
	Millimols.	Grams.			Millimols.	Grams.	
0	424.5	31.66	1.180	54.23	238.5	17.79	1.219
13.28	383.4	28.61	1.185	83.84	149.0	11.11	1.259
25.98	339.3	25.31	1.194	100.00	110.6	8.25	1.286
45.36	271.4	20.24	1.211				

100 grams H<sub>2</sub>O dissolve 246.5 grams sugar + 44.8 grams KCl at 31.25°, or 100 grams of the sat. solution contain 62.28 grams sugar + 11.33 grams KCl.

(Köhler — Z. Ver. Zuckerind. 47, 447, '97.)

# **POTASSIUM CHROMATE K<sub>2</sub>CrO<sub>4</sub>.**

## **POTASSIUM (Di) CHROMATE K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>.**

### **SOLUBILITY OF EACH IN WATER.**

(Alluard — Compt. rend. 59, 500, '64; Nordenskjöld and Lindström — Pogg. Ann. 136, 314, '69; Etard — Ann. chim. phys. [7] 2, 527, '94; Kremers — Pogg. Ann. 92, 497, '54; Tilden and Shenstone — Phil. Trans. 23, 1884.)

t°.	Potassium Chromate.			Potassium Di Chromate.	
	Grams per 100 Grams Water.			Grams per 100 Grams Water.	
0	58.2*	59.3†	60.2‡	5*	5§
10	60.0	61.2	62.5	7	7
20	61.7	63.2	64.5	12	12
25	62.5	64.2	64.5	16	16
30	63.4	65.2	66.5	20	20
40	65.2	67.0	68.6	26	27
50	66.8	69.0	70.6	34	37
60	68.6	71.0	72.7	43	47
70	70.4	73.0	74.8	52	58
80	72.1	75.0	76.9	61	70
90	73.9	77.0	79.0	70	82
100	75.6	79.0	82.2	80	97
125	79.0	...	...	110	145
150	83.0	...	...	143	205

\* Etard.

† Alluard.

‡ N. and L.

§ A., K., T. and S.

**SOLUBILITY OF POTASSIUM CHROMATES IN WATER AT 30°.**

(Schreinemaker — Z. physik. Ch. 55, 83, '06.)

Composition in Wt. per cent of:				Solid Phase.
The Solution.		The Residue.		
Per cent $\text{CrO}_3$ .	Per cent $\text{K}_2\text{O}$ .	Per cent $\text{CrO}_3$ .	Per cent $\text{K}_2\text{O}$ .	
0	$\pm 47$	...	...	$\text{KOH} \cdot \text{H}_2\text{O}$
0.0	47.16	12.59	47.54	$\text{K}_2\text{CrO}_4$
0.1775	34.602	10.93	37.47	"
1.351	26.602	16.482	32.532	"
5.598	20.584	37.131	39.922	"
15.407	19.225	27.966	29.377	"
20.67	19.17	...	...	$\text{K}_2\text{CrO}_4 + \text{K}_2\text{Cr}_2\text{O}_7$
19.096	17.30	37.64	22.61	$\text{K}_2\text{Cr}_2\text{O}_7$
11.35	7.88	...	...	"
17.93	3.412	25.85	7.82	"
43.51	3.01	49.45	9.91	"
44.46	3.245	53.94	12.40	$\text{K}_2\text{Cr}_2\text{O}_7 + \text{K}_2\text{Cr}_2\text{O}_{10}$
46.368	2.823	60.314	12.935	$\text{K}_2\text{Cr}_2\text{O}_{10}$
49.357	2.353	63.044	11.684	$\text{K}_2\text{Cr}_2\text{O}_{10} + \text{K}_2\text{Cr}_4\text{O}_{11}$
53.215	1.360	62.958	8.002	$\text{K}_2\text{Cr}_4\text{O}_{11}$
62.55	0.796	67.944	6.731	"
62.997	0.621	70.0	4.0	$\text{K}_2\text{Cr}_4\text{O}_{11} + \text{CrO}_3$
62.28	0.0	...	...	$\text{CrO}_3$

100 gms. sat. solution in glycol  $\text{C}_2\text{H}_4(\text{OH})_2 \cdot \text{H}_2\text{O}$  contain 1.7 gms.  $\text{K}_2\text{CrO}_4$  at 15.4°.

100 gms. sat. solution in glycol  $\text{C}_2\text{H}_4(\text{OH})_2 \cdot \text{H}_2\text{O}$  contain 6.0 gms.  $\text{K}_2\text{Cr}_2\text{O}_7$  at 14.6°.

(de Coninck — Bull. acad. roy. Belgique, 257, '05.)

**POTASSIUM CITRATE  $\text{C}_6\text{H}_4(\text{OH})(\text{COOK})_3 \cdot \text{H}_2\text{O}$ .****SOLUBILITY IN WATER AND IN SATURATED SUGAR SOLUTION AT 31.25°.**

(Köhler — Z. Ver. Zuckerind. 47, 447, '97.)

100 gms.  $\text{H}_2\text{O}$  dissolve 169.7 gms.  $\text{C}_6\text{H}_5\text{O}_7\text{K}_3$ , or 100 gms. sat. solution contain 61.11 gms.

100 gms.  $\text{H}_2\text{O}$  dissolve 198.3 gms.  $\text{C}_6\text{H}_5\text{O}_7\text{K}_3 + 303.9$  gms. sugar, or 100 gms. sat. solution contain 32.83 gms.  $\text{C}_6\text{H}_5\text{O}_7\text{K}_3 + 50.3$  gms. sugar.

**POTASSIUM CYANATE  $\text{KCNO}$ .****SOLUBILITY IN ALCOHOLIC MIXTURES.**

(Erdmann — Ber. 26, 2439, '93.)

Solvent.	Grams $\text{KCNO}$ per Liter Solvent at 5. pt.
80 per cent Alcohol + 20 per cent Water	62
80 per cent Alcohol + 20 per cent Methyl Alcohol	76
80 per cent Alcohol + 10 per cent Acetone	82

**POTASSIUM CYANIDE  $\text{KCN}$ .**

100 gms.  $\text{H}_2\text{O}$  dissolve 122.2 gms.  $\text{KCN}$ , or 100 gms. sat. solution contain 55.0 gms.  $\text{KCN}$  at 103.3°.

100 gms. abs. ethyl alcohol dissolve 0.87 gm.  $\text{KCN}$  at 19.5°.

100 gms. abs. methyl alcohol dissolve 4.91 gms.  $\text{KCN}$  at 19.5°.

(de Bruyn — Z. physik. Ch. 10, 783, '98.)

100 gms. glycerine dissolve 32 gms.  $\text{KCN}$  at 15.5°.

**POTASSIUM CYANIDES** 250

**POTASSIUM CHROMOCYANIDE**  $K_2Cr(CN)_6$ .

100 gms.  $H_2O$  dissolve 32.33 gms.  $K_2Cr(CN)_6$  at  $20^\circ$ .

(Moissan — Ann. chim. phys. [6] 4, 136, '85; Christensen — J. pr. Ch. [2] 31, 166, '85.)

**POTASSIUM CHROMISULPHOCYANIDE**  $K_2Cr(SCN)_6 \cdot 4H_2O$ .

100 gms.  $H_2O$  dissolve 139 gms. salt.

(Karsten — Ann. Suppl. 3, 170.)

**POTASSIUM CARBONYL FERROCYANIDE**  $K_4FeCO(CN)_6 \cdot 3\frac{1}{2}H_2O$ .

100 gms.  $H_2O$  dissolve 148 gms. salt at  $16^\circ$ .

(Müller — Compt. rend. 104, 992, '87.)

**POTASSIUM FERRICYANIDE**  $K_3Fe(CN)_6$ .

**POTASSIUM FERROCYANIDE**  $K_4Fe(CN)_6 \cdot 3H_2O$ .

SOLUBILITY OF EACH IN WATER.

(Wallace — J. Ch. Soc. 7, 80, '85; Etard — Ann. chim. phys. [7] 2, 526, '94; Schiff — Liebig's Ann. 113, 350, '60; Michel and Krafft — Ann. chim. phys. [3] 41, 478, '58; Thomsen.)

NOTE. — The available determinations fall very irregularly when plotted on cross-section paper, and the following figures, which are averages, are therefore hardly more than rough approximations to the true amounts. The figures under  $K_4Fe(CN)_6$  show the limits between which the correct values probably lie.

t°.	Grams per 100 Gms. $H_2O$ .			t°.	Grams per 100 Gms. $H_2O$ .		
	$K_3Fe(CN)_6$ .	$K_4Fe(CN)_6$ .			$K_3Fe(CN)_6$ .	$K_4Fe(CN)_6$ .	
0	31	13	...	40	60	38	70
10	36	20	20	60	66	52	83
20	43	25	40	80	...	66	89
25	46	28	48	100	...	76	91
30	50	32	57	104.4	82.6	...	...

**POTASSIUM FLUORIDE**  $KF \cdot 2H_2O$ .

100 gms.  $H_2O$  dissolve 92.3 gms.  $KF$ , or 100 gms. sat. solution contain 48 gms.  $KF$  at  $18^\circ$ . Sp. Gr. of solution = 1.502.

(Mylius and Funk — Ber. 30, 1718, '97.)

SOLUBILITY OF POTASSIUM FLUORIDE IN HYDROFLUORIC ACID AT  $21^\circ$ .

(Ditte — Compt. rend. 123, 1282, '96.)

Gms. per 100 Gms. $H_2O$ .		Gms. per 100 Gms. $H_2O$ .		Gms. per 100 Gms. $H_2O$ .	
HF.	KF.	HF.	KF.	HF.	KF.
0.0	96.3	9.25	29.9	20.68	38.4
1.21	72.0	11.36	29.6	28.60	46.9
1.61	61.0	12.50	30.5	41.98	61.8
3.73	40.4	13.95	31.4	53.71	74.8
4.03	32.5	15.98	33.4	74.20	105.0
6.05	30.4	17.69	35.62	119.20	169.5

## POTASSIUM FORMATE HCOOK.

SOLUBILITY OF POTASSIUM FORMATE AND OF THE ACID SALT  
IN WATER.

(Groschuff — Ber. 36, 1785, 1903.)

Solid Phase : HCOOK			Solid Phase : HCOOK. HCOOH.					
t°.	Gms. HCOOK per 100 Gms. Solution.	Mols. HCOOK per 100 Mols. H <sub>2</sub> O.	t°.	Gms. HCOOK per 100 Gms. Solution.	Gms. HCOOH per 100 Gms. Solution.	t°.	Gms. HCOOK per 100 Gms. Solution.	Mols. HCOOH per 1 Mol. HCOOK.
- 20	72.8	57.4	0	60.4	39.0	0	36.3	3.21
+ 18	76.8	71.0	25	69.8	45.1	19.5	38.2	2.96
50	80.7	89.8	50	79.2	51.2	39.3	40.8	2.65
90	86.8	141.0	80	90.7	58.6	60	44.0	2.33
120	92.0	247.0				70	45.9	2.16
140	96.0	511				90	52.1	1.68
157	100.0	∞						

Sp. Gr. of sat. sol. at 18° = 1.573.

NOTE. — Since the acid salt is less soluble at ordinary temperatures than the neutral salt, it can be precipitated from the solution of the neutral salt by addition of aqueous formic acid. Proceeding in this way an impure product is obtained, giving solubility values (expressed in HCOOK) as shown in the last three columns above.

POTASSIUM FLUOGERMANATE K<sub>2</sub>GeF<sub>6</sub>.

## SOLUBILITY IN WATER.

(Winkler; Kruss and Nilson — Ber. 20, 1696, '87.)

100 gms. H<sub>2</sub>O dissolve 173.98 gms. K<sub>2</sub>GeF<sub>6</sub> at 18°, and 34.07 gms. at 100° (W.).

100 gms. H<sub>2</sub>O dissolve 184.61 gms. K<sub>2</sub>GeF<sub>6</sub> at 18°, and 38.76 gms. at 100° (K. and N.).

## POTASSIUM HYDROXIDE KOH.

## SOLUBILITY IN WATER.

(Pickering — J. Ch. Soc. 63, 908, '03; at 15°, Ferchland — Z. anorg. Ch. 30, 133, '02.)

t°.	Gms. KOH per 100 Gms.		Solid Phase.	t°.	Gms. KOH per 100 Gms.		Solid Phase.
	Water.	Solution.			Water.	Solution.	
- 22	3.7	3.6	Ice	15	107	51.7	KOH.2H <sub>2</sub> O
- 20.7	22.5	18.4	"	20	112	52.8	"
- 65.2	44.5	30.8	"	30	126	55.76	"
- 36.2	36.2	26.6	KOH.4H <sub>2</sub> O	32.5	135	57.44	KOH.2H <sub>2</sub> O + KOH.H <sub>2</sub> O
- 32.7	77.94	43.8	"	50	140	58.33	KOH.H <sub>2</sub> O
- 33	80	44.4	KOH.4H <sub>2</sub> O + KOH.2H <sub>2</sub> O	100	178	64.03	"
- 23.2	85	45.9	KOH.2H <sub>2</sub> O	125	213	68.06	"
0	97	49.2	"	143	311.7	75.73	"
10	103	50.7	"				

Sp. Gr. of sat. solution at 15° = 1.5355.

# POTASSIUM IODATE

252

## POTASSIUM IODATE $KIO_3$ .

### SOLUBILITY IN WATER.

(Kremers — Pogg. Ann. 97, 5, '56; at 30°, Meerburg — Ch. Weekbl. I, 474, '04.)

t°	0°	20°	30°	40°	60°	80°	100°
Gms. $KIO_3$ per 100 gms. $H_2O$	4.73	8.13	11.73	12.8	18.5	24.8	32.2

100 gms.  $H_2O$  dissolve 1.3 gms. potassium hydrogen iodate ( $KH(IO_3)_2$ ), at 15°, and 5.4 gms. at 17°.

(Serullas — Ann. chim. phys. 22, 118.)

100 gms.  $H_2O$  dissolve 4.0 gms. potassium di hydrogen iodate  $KH_2(IO_3)_2$ , at 15°.

(Meineke — Liebig's Ann. 261, 360, '91.)

## POTASSIUM IODIDE KI.

### SOLUBILITY IN WATER.

(Mulder; de Coppet — Ann. chim. phys. [5] 30, 417, '83; Etard — *Ibid.* [7] 2, 526, '94; Meusser — Z. anorg. Ch. 44, 80, '05; see also Tilden and Shenstone — Phil. Trans. 23, '84; Schreinemaker — Z. physik. Chem. 9, 71, '92.)

t°.	Gms. KI per 100 Gms.		t°.	Gms. KI per 100 Gms.	
	Water.	Solution.		Water.	Solution.
— 10	115.1	53.5	80	192	65.8
— 5	119.8	54.5	90	200	66.7
— 1	122.2	55.0	100	208	67.5
0	127.5	56.0	110	215	68.3
10	136	57.6	120	223	69.0
20	144	59.0	Ice Curve		
25	148	59.7			
30	152	60.3	— 5	25.7	22.5
40	160	61.5	— 7	42.6	29.9
50	168	62.7	— 9.5	51.5	34.0
60	176	63.7	— 11.5	64.7	39.3
70	184	64.8	— 14	75.8	42.7

### SOLUBILITY OF POTASSIUM IODIDE IN ABSOLUTE ALCOHOLS.

(de Bruyn — Z. physik. Ch. 10, 783, '92; Rohland — Z. anorg. Ch. 18, 327, '98.)

100 gms. methyl alcohol dissolve 16.5 gms. KI at 20.5°.

100 gms. ethyl alcohol dissolve 1.75 gms. KI at 20.5°.

100 gms. propyl alcohol dissolve 0.46 gm. KI at 15°–20° (R.).

### SOLUBILITY OF POTASSIUM IODIDE IN:

Ethyl Alcohol  
of 0.9496 Sp. Gr.

Aqueous Ethyl Alcohol at 18°.

t°.	Gms. KI per 100 Gms. Alcohol	Sp. Gr. of Alcohol.	Weight per cent Alcohol.	Gms. KI per 100 Gms. Alcohol.	Sp. Gr. of Alcohol.	Weight per cent Alcohol.	Gms. KI per 100 Gms Alcohol.
8	67.4	0.9904	5.2	130.5	0.9390	45	66.4
13	69.2	0.9851	9.8	119.4	0.9088	59	48.2
25	75.1	0.9726	23.0	100.1	0.8464	86	11.4
46	84.7	0.9665	29.0	89.9	0.8322	91	6.2
55	87.5	0.9528	38.0	76.9			
62	90.2						

(Gerardin — Ann. chim. phys. [4] 5, 155, '65.)

## SOLUBILITY OF POTASSIUM IODIDE IN ACETONE AND IN PYRIDINE.

(von Laszcynski — Ber. 27, 2285, '94; at 25°, Krug and McElroy — J. Anal. Ch. 6, 184, '92.)

Solvent.	Gms. KI per 100 Gms. Solvent at:					
	-2.5°.	10°.	22°.	25°.	56°.	119°.
Acetone	3.08	...	2.38	2.93	1.21	...
Pyridine	...	0.26	...	...	...	0.11

100 gms. glycerine dissolve 40 gms. KI at 15.5°.

## SOLUBILITY OF POTASSIUM IODIDE IN SEVERAL SOLVENTS.

(Walden — Z. physik. Ch. 55, 714, '06.)

Solvent.	Formula.	t°.	Sp. Gr. of Solution.	Gms. KI per 100	
				cc. Solution.	Gms. Solution.
Water	H <sub>2</sub> O	0	1.6699	94.05	56.32
Water	H <sub>2</sub> O	25	1.7254	102.70	59.54
Methyl Alcohol	CH <sub>3</sub> OH	0	0.8964	11.61	12.95
Methyl Alcohol	CH <sub>3</sub> OH	25	0.9003	13.5-14.3	14.97
Ethyl Alcohol	C <sub>2</sub> H <sub>5</sub> OH	0	0.8085	1.197	1.479
Ethyl Alcohol	C <sub>2</sub> H <sub>5</sub> OH	25	0.7908	1.520	1.922
Glycol	(CH <sub>2</sub> OH) <sub>2</sub>	0	1.3954	43.28	31.03
Glycol	(CH <sub>2</sub> OH) <sub>2</sub>	25	1.3888	47.23	33.01
Acetonitril	CH <sub>3</sub> CN	0	0.8198	1.852	2.259
Acetonitril	CH <sub>3</sub> CN	25	0.7938	1.57	2.003
Propionitril	C <sub>2</sub> H <sub>5</sub> CN	0	0.8005	0.34-0.41	0.0429
Propionitril	C <sub>2</sub> H <sub>5</sub> CN	25	0.7821	0.32-0.36	0.0404
Benzonitril	C <sub>6</sub> H <sub>5</sub> CN	25	1.0076	0.051	0.0506
Nitro Methane	CH <sub>3</sub> NO <sub>2</sub>	0	1.1627	0.314-0.366	0.315
Nitro Methane	CH <sub>3</sub> NO <sub>2</sub>	25	1.1367	0.289-0.349	0.307
Nitro Benzene	C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub>	25	...	0.0019	...
Acetone	(CH <sub>3</sub> ) <sub>2</sub> CO	0	0.8227	1.732	2.105
Acetone	(CH <sub>3</sub> ) <sub>2</sub> CO	25	0.7968	1.038	1.302
Furfurol	C <sub>4</sub> H <sub>3</sub> O.CO.H	0	...	15.10	...
Furfurol	C <sub>4</sub> H <sub>3</sub> O.CO.H	25	1.2014	5.93	4.94
Benzaldehyde	C <sub>6</sub> H <sub>5</sub> .CO.H	25	1.0446	0.343	0.328
Salicyl aldehyde	C <sub>6</sub> H <sub>4</sub> .OH.CO.H	0	1.1501	1.257	1.093
Salicyl aldehyde	C <sub>6</sub> H <sub>4</sub> .OH.CO.H	25	1.1373	0.549	0.483
Anis aldehyde	C <sub>6</sub> H <sub>4</sub> .OCH <sub>3</sub> .CO.H	0	1.1223	1.520	1.355
Anis aldehyde	C <sub>6</sub> H <sub>4</sub> .OCH <sub>3</sub> .CO.H	25	1.1180	0.720	0.644
Ethyl Acetate	CH <sub>3</sub> .COOC <sub>2</sub> H <sub>5</sub>	25	...	0.0013	...
Methyl Cyan Acetate	CH <sub>3</sub> CNCOOCH <sub>3</sub>	0	1.1521	3.256	2.827
Methyl Cyan Acetate	CH <sub>3</sub> CNCOOCH <sub>3</sub>	25	1.1358	2.459	2.165
Ethyl Cyan Acetate	CH <sub>3</sub> CNCOOC <sub>2</sub> H <sub>5</sub>	25	1.0628	0.989	0.930



# POTASSIUM NITRITE

254

# POTASSIUM NITRITE $\text{KNO}_2$ .

100 gms.  $\text{H}_2\text{O}$  dissolve about 300 gms.  $\text{KNO}_2$  at  $15.5^\circ$ .

(Divers — J. Ch. Soc. 75, 86, '99.)

# POTASSIUM NITRATE $\text{KNO}_3$ .

## SOLUBILITY IN WATER.

(Mulder; Andrae — J. pr. Ch. [2] 20, 456, '84; Gerardin — Ann. chim. phys. [4] 5, 150, '65; Etard — *Ibid.* [7] 2, 526, '04; Ost — J. pr. Ch. [2] 17, 233, '78; at  $31.25^\circ$ ; Köhler — Z. Ver. Zuckerind. 47, 447, '97; Euler — Z. physik. Ch. 49, 315, '04; Tilden and Shenstone — Phil. Trans. 23, '84; Berkeley — Trans. Roy. Soc. 203 A, 213, '04.)

## Average Curve.

t°.	Gms. $\text{KNO}_3$ per 100 Gms.		t°.	Gms. $\text{KNO}_3$ per 100 Gms.	
	Water.	Solution.		Water.	Solution.
0	13.3	11.7	70	138	58.0
10	20.9	17.3	80	169	62.8
20	31.6	24.0	90	202	66.9
25	37.3	27.2	100	246	71.1
30	45.8	31.4	110	300	75.0
40	63.9	39.0	120	394	79.8
50	85.5	44.0	125	493	83.1
60	110.0	52.0			

## SOLUBILITY OF MIXTURES OF POTASSIUM NITRATE AND BARIUM NITRATE IN WATER.

(Euler — Z. physik. Ch. 49, 313, '04.)

t°.	Sp. Gr. of Sat. Solution.	Grams per 100 Grams $\text{H}_2\text{O}$ .	
17	1.120	13.26 $\text{KNO}_3$ +	6.31 $\text{Ba}(\text{NO}_3)_2$
21.5	...	17.00 " +	7.58 "
30	1.191	24.04 " +	9.99 "
50	...	49.34 " +	18.09 "

## SOLUBILITY OF POTASSIUM NITRATE IN AQUEOUS SOLUTIONS OF NITRIC ACID AT $0^\circ$ .

(Engel — Compt. rend. 104, 913, '87.)

Sp. Gr. of Solutions.	Equivalents per 10 cc. Solution.				Grams per 100 cc. Solution.			
	12.5 $\text{KNO}_3$	0	$\text{HNO}_3$		12.65 $\text{KNO}_3$	0.00 $\text{HNO}_3$		
1.079	12.5	"	5.87	"	10.02	"	3.71	"
...	9.9	"	13.2	"	8.38	"	8.38	"
1.093	8.28	"	21.55	"	7.49	"	13.58	"
1.117	7.4	"	31.1	"	7.49	"	19.47	"
1.144	7.4	"	48.0	"	7.68	"	30.04	"
1.202	10.3	"	68.0	"	10.42	"	42.86	"
1.289	28.3	"	120.5	"	28.64	"	75.95	"

**SOLUBILITY OF POTASSIUM NITRATE AND OF ACID POTASSIUM NITRATES  
IN NITRIC ACID.**

(Groschuff — Ber. 37, 1490, '04.)

NOTE. — Determinations made by the so-called thermometric method, *i.e.*, by observing the temperature of the disappearance of the separated, finely divided solid from solutions of known concentration.

t°.	Gms. per 100 Gms. Solution.		Solid Phase.	t°.	Gms. per 100 Gms. Solution.		Solid Phase.
	KNO <sub>3</sub> .	HNO <sub>3</sub> .			KNO <sub>3</sub> .	HNO <sub>3</sub> .	
— 6	24.4	75.41	KNO <sub>3</sub> ·HNO <sub>3</sub> (1)	22.5	47.2	52.93	KNO <sub>3</sub> ·HNO <sub>3</sub>
+14	32.6	67.42	" (stabil)	23.5	47.8	52.11	" (stabil)
17	34.8	65.04	"	25.5	48.6	51.46	"
19.5	37.2	62.90	"	27.0	49.4	50.78	"
22	44.5	55.46	"	29.0	50.1	49.94	KNO <sub>3</sub> ·HNO <sub>3</sub>
21.5	47.8	52.11	KNO <sub>3</sub> ·HNO <sub>3</sub> (2)	30.5	50.9	49.15	" (labil)
21.5	48.6	51.46	" (labil)	21.0	49.4	50.78	KNO <sub>3</sub> (labil)
20	50.9	49.15	"	39.0	50.9	49.15	" (stabil)
— 4	37.2	62.81	KNO <sub>3</sub> ·HNO <sub>3</sub>	50	51.7	48.32	"
—16.5	44.5	55.46	" (labil)				

(1) Solution in HNO<sub>3</sub>.

(2) Solution in KNO<sub>3</sub>.

**CONDUCT OF ACID POTASSIUM NITRATE TOWARDS WATER.**

t°.	Gms. per 100 Gms. Solution.		Solid Phase.	t°.	Gms. per 100 Gms. Solution.		Solid Phase.
	KNO <sub>3</sub> .	HNO <sub>3</sub> .			KNO <sub>3</sub> .	HNO <sub>3</sub> .	
22	44.5	55.5	KNO <sub>3</sub> ·HNO <sub>3</sub>	50	38.7	48.3	KNO <sub>3</sub>
20.5	44.1	55.0	"	61	36.0	44.8	"
18	43.8	54.5	"	63	34.5	43.0	"
12	43.0	53.6	"	60.5	30.9	39.5	"
6	42.3	52.7	"	56	27.6	34.4	"
0	41.6	51.8	"	43	20.8	25.9	"
12	41.3	51.4	KNO <sub>3</sub>	17	11.7	16.6	"
22	40.9	51.0	"	—5	5.54	6.91	"
40	39.9	49.8	"				

**SOLUBILITY OF MIXTURES OF POTASSIUM NITRATE AND POTASSIUM  
CHLORIDE IN WATER.**

(Etard — Ann. chim. phys. [7] 3, 283, '94; at 20°, Rüdorff — Ber. 6, 482, '73; Nicol — Phil. Mag. [5] 31, 385, '91.)

t°.	Gms. per 100 Gms. Solution.		t°.	Gms. per 100 Gms. Solution.		t°.	Gms. per 100 Gms. Solution.	
	KNO <sub>3</sub> .	KCl.		KNO <sub>3</sub> .	KCl.		KNO <sub>3</sub> .	KCl.
0	5.0	20.0	30	16.0	21.2	70	39.5	17.5
10	8.0	20.8	40	21.0	21.0	80	45.5	15.8
20	12.6	21.2	50	27.0	20.0	100	57.5	11.6
25	14.0	21.3	60	33.5	19.0	120	69.0	7.7

SOLUBILITY OF POTASSIUM NITRATE IN AQUEOUS SOLUTIONS OF:  
(Touren — Compt. rend. 131, 259, '00.)

Potassium Carbonate.				Potassium Bi Carbonate.			
Results at 14.5°.				Results at 14.5°.			
Mols. per Liter		Gms. per Liter.		Mols. per Liter.		Grams per Liter.	
$K_2CO_3$	$KNO_3$	$K_2CO_3$	$KNO_3$	$KHCO_3$	$KNO_3$	$KHCO_3$	$KNO_3$
0.0	2.228	0.0	225	0.0	2.33	0.0	236
0.48	1.85	66.4	188	0.39	2.17	39.0	220
1.25	1.39	172.9	141	0.76	2.03	76.0	205
2.58	0.86	356.9	87	1.16	1.92	116	194
3.94	0.64	544.9	65	1.55	1.81	155	183
Results at 25°.				Results at 25°.			
0.0	3.217	0.0	326	0.0	3.28	0.0	332
0.59	2.62	81.6	265	0.89	2.84	89	287
1.35	1.97	186.7	199	1.33	2.65	133	268
2.10	1.46	290.5	148	1.91	2.45	191	249
2.70	1.14	373.6	115				
3.58	0.79	495.1	80				

SOLUBILITY OF MIXTURES OF POTASSIUM NITRATE AND POTASSIUM  
SULPHATE IN WATER.  
(Euler — Z. physik. Ch. 49, 313, '04.)

t°.	Sp. Gr. of Sat. Solution.	Grams per 100 Grams Water.	
15	1.165	24.12 $KNO_3$	5.65 $K_2SO_4$
20	...	30.10 "	5.58 "
25	1.210	36.12 "	5.58 "

SOLUBILITY OF MIXTURES OF POTASSIUM NITRATE AND SODIUM  
CHLORIDE IN WATER.

(Etard — Ann. chim. phys. [7] 3, 283, '94; the older determinations of Rüdorff, Karsten, Mulder, etc., agree well with those of Etard.)

t°.	Gms. per 100 Gms. Solution.		t°.	Gms. per 100 Gms. Solution.		t°.	Gms. per 100 Gms. Solution.	
	$KNO_3$	NaCl.		$KNO_3$	NaCl.		$KNO_3$	NaCl.
0	13	24	40	30.5	19	120	73	8.0
10	16	23	50	36	17	140	77	7.0
20	20	22	60	42.5	15	160	79.5	6.0
25	23	21.5	80	55	12	170	80.5	5.5
30	25	20.5	100	67	9.5			

SOLUBILITY OF POTASSIUM NITRATE IN AQUEOUS SOLUTIONS OF SODIUM  
NITRATE AND VICE VERSA AT 20°.

(Carnelly and Thomson — J. Ch. Soc. 53, 782, '88; Nicol — Phil. Mag. 31, 369, '91.)

$KNO_3$  in Aq.  $NaNO_3$  Solutions.       $NaNO_3$  in Aq.  $KNO_3$  Solutions.

Grams per 100 Grams $H_2O$ .		Grams per 100 Grams $H_2O$ .	
$NaNO_3$	$KNO_3$	$KNO_3$	$NaNO_3$
0	31.6	0	88
10	30.5	10	90
20	31.0	20	92
40	33.0	25	93
60	35.5	30	94
80	41.0	35	96

# SOLUBILITY OF MIXTURES OF POTASSIUM NITRATE AND SILVER NITRATE IN WATER.

(Etard — Ann. chim. phys. [7] 3, 283, '94.)

t°.	Gms. per 100 Gms. Sol.		t°.	Gms. per 100 Gms. Sol.		t°.	Gms. per 100 Gms. Sol.	
	KNO <sub>3</sub>	AgNO <sub>3</sub>		KNO <sub>3</sub>	AgNO <sub>3</sub>		KNO <sub>3</sub>	AgNO <sub>3</sub>
0	13.5	43.0	30	26.8	49.4	80	36.2	55.1
10	19.0	44.7	40	29.6	51.5	100	38.3	55.3
20	23.0	47.0	50	32.0	54.0	120	40.0	55.6
25	25.0	48.0	60	33.5	54.8	140	41.5	55.8

# SOLUBILITY OF MIXED CRYSTALS OF POTASSIUM NITRATE AND SILVER NITRATE IN WATER AT 25°.

(Herz — Inaug. Diss. (Berlin) '05; Calc. by Fock — Z. Kryst. Min. 28, 405, '07.)

Grams per Liter.		Mg. Mols. per Liter.		Mol. per cent	
AgNO <sub>3</sub>	KNO <sub>3</sub>	AgNO <sub>3</sub>	KNO <sub>3</sub>	AgNO <sub>3</sub> in Solution.	AgNO <sub>3</sub> in Solid Phase.
45.9	321.8	270	3180	7.83	0.2896
110.7	322.6	651.3	3184	16.96	0.6006
176.8	333.7	1040	3298	23.97	0.9040
259.6	364.0	1528	3597	29.81	1.054
365.6	456.4	2151	4511	32.28	1.604
507.9	387.2	2988	3816	43.85	2.439
745.9	398.6	4388	3960	52.70	8.294

# SOLUBILITY OF MIXED CRYSTALS OF POTASSIUM NITRATE AND THALLIUM NITRATE IN WATER AT 25°.

(Fock.)

Grams per Liter.		Mg. Mols. per Liter.		Mol. per cent TlNO <sub>3</sub> in Solution.	Sp. Gr. of Solutions.	Mol. per cent TlNO <sub>3</sub> in Solid Phase.
TlNO <sub>3</sub>	KNO <sub>3</sub>	TlNO <sub>3</sub>	KNO <sub>3</sub>			
0.00	351.0	0.0	3468.2	0.00	1.2632	0.00
2.37	329.0	8.9	3251.5	0.43	1.1903	0.08
6.15	332.4	23.1	3285.1	0.70	1.1956	0.20
17.64	333.7	66.3	3298.1	1.97	1.2050	0.57
49.74	333.3	186.9	3294.4	5.37	1.2196	1.78
63.60	321.0	239.0	3172.4	7.01	1.2436	2.19
86.18	330.5	323.8	3265.8	9.02	1.2617	2.77
123.8	428.3	465.2	4232.6	9.90	1.2950	6.00
101.3	245.1	380.6	2423.3	13.58	1.2050	93.33
116.1	0.0	463.1	0.0	100.00	1.0964	100.00

# SOLUBILITY OF POTASSIUM NITRATE IN AQUEOUS ALCOHOL SOLUTIONS.

(Gerardin — Ann. chim. phys. [4] 5, 151, '65.)

Grams KNO<sub>3</sub> per 100 Grams Aqueous Alcohol of Sp. Gr.:

t°.	0.9904 = 5.5 Wt. %.	0.9843 = 9.35 Wt. %.	0.9793 = 13.6 Wt. %.	0.9726 = 19.1 Wt. %.	0.9571 = 30 Wt. %.	0.939 = 40 Wt. %.	0.8967 = 60 Wt. %.	0.8429 = 80 Wt. %.
10	17	13	10	7	4.5	3	1	0.2
18	22.5	18.5	14.5	10	6.2	4.5	1.6	0.3
20	24	20	16	11	7.0	5	2	0.3
25	29	24.5	20	13.5	9.0	6.5	2.5	0.4
30	36	30	25	17	11.5	8	3.0	0.5
40	52	43	36	27	16.5	11	4	0.6
50	72	61	50	38	23.0	16	6	0.7
60	93	79	69	52	31.0	21	8	1.1

# POTASSIUM NITRATE

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## SOLUBILITY OF POTASSIUM NITRATE IN AQUEOUS ALCOHOL AT 18°.

(Bodländer — Z. physik. Ch. 7, 316, '91.)

Sp. Gr. of Solution.	Gms. per 100 cc. Solution.			Sp. Gr. of Solution.	Gms. per 100 cc. Solution.		
	C <sub>2</sub> H <sub>5</sub> OH.	H <sub>2</sub> O.	KNO <sub>3</sub> .		C <sub>2</sub> H <sub>5</sub> OH.	H <sub>2</sub> O.	KNO <sub>3</sub> .
1.1480	...	89.80	25.0	1.0120	23.33	69.81	8.06
1.1085	3.30	87.44	20.11	0.9935	28.11	64.74	6.50
1.1010	5.24	86.26	18.60	0.9585	37.53	54.21	4.11
1.0805	8.69	83.18	16.18	0.9450	42.98	48.15	3.37
1.0755	9.06	83.10	15.39	0.9050	51.23	27.32	1.95
1.0655	14.08	77.93	14.54	0.8722	61.65	24.74	0.83
1.0490	16.27	76.36	12.27	0.8375	69.60	13.95	0.20
1.0375	19.97	72.93	10.85				

## SOLUBILITY OF POTASSIUM NITRATE IN AQUEOUS ALCOHOL AND IN AQUEOUS ACETONE.

(Bathrick — J. Physic. Ch. 1, 160, '96.)

In Aqueous Alcohol.			In Aqueous Acetone at 40°.	
Wt. per cent Alcohol.	Gms. KNO <sub>3</sub> per 100 Gms. Aq. Alcohol.		Wt. per cent Acetone.	Gms. KNO <sub>3</sub> per 100 Gms. Solvent.
	At 30°.	At 40°.		
0	45.6	64.5	0	64.5
8.25	32.3	47.1	8.5	51.3
17.0	22.4	33.3	16.8	38.9
25.7	15.1	24.1	25.2	22.8
35.0	11.4 (34.4°)	16.7	34.3	24.7
44.9	7.0	11.6 (44°)	44.1	17.0
54.3	4.5	7.2 (55°)	53.9	11.9
65.0	2.7	4.4	64.8	7.2
75.6	1.3	2.0 (76.3°)	76.0	3.0
88.0	0.4	0.6 (88.5°)	87.6	0.7

100 grams H<sub>2</sub>O saturated with sugar and KNO<sub>3</sub> dissolve 224.7 gms. sugar + 41.9 gms. KNO<sub>3</sub>, or 100 gms. of the saturated solution contain 61.36 gms. sugar + 11.45 gms. KNO<sub>3</sub> at 31.25°.

(Köhler — Z. Ver Zuckerind. 47, 447, '97.)

# POTASSIUM OXALATE K<sub>2</sub>C<sub>2</sub>O<sub>4</sub>·4H<sub>2</sub>O.

## SOLUBILITY OF MIXTURES OF POTASSIUM OXALATE AND OXALIC ACID IN WATER AT 25°.

(Foote and Andrew — Am. Ch. J. 34, 155, '05.)

Gms. per 100 Gms. Solution.		Mols. per 100 Mols. H <sub>2</sub> O.		Solid Phase.
H <sub>2</sub> C <sub>2</sub> O <sub>4</sub> .	K <sub>2</sub> C <sub>2</sub> O <sub>4</sub> .	H <sub>2</sub> C <sub>2</sub> O <sub>4</sub> .	K <sub>2</sub> C <sub>2</sub> O <sub>4</sub> .	
10.2	...	2.274	...	H <sub>2</sub> C <sub>2</sub> O <sub>4</sub> ·2H <sub>2</sub> O
10.31	0.04	2.302	0.005	H <sub>2</sub> C <sub>2</sub> O <sub>4</sub> ·2H <sub>2</sub> O + H <sub>3</sub> K(C <sub>2</sub> O <sub>4</sub> ) <sub>2</sub> ·2H <sub>2</sub> O
9.26	0.13	2.046	0.016	} Double salt H <sub>3</sub> K(C <sub>2</sub> O <sub>4</sub> ) <sub>2</sub> ·2H <sub>2</sub> O
3.39	0.63	0.707	0.071	
2.06	4.26	0.440	0.495	H <sub>3</sub> K(C <sub>2</sub> O <sub>4</sub> ) <sub>2</sub> ·2H <sub>2</sub> O + HKC <sub>2</sub> O <sub>4</sub>
1.16	11.50	0.266	1.427	} Double salt HKC <sub>2</sub> O <sub>4</sub>
0.99	16.93	0.240	2.235	
0.85	21.08	0.221	2.928	HKC <sub>2</sub> O <sub>4</sub> + H <sub>3</sub> K <sub>4</sub> (C <sub>2</sub> O <sub>4</sub> ) <sub>3</sub> ·2H <sub>2</sub> O
0.82	21.49	0.211	2.998	} Double salt H <sub>3</sub> K <sub>4</sub> (C <sub>2</sub> O <sub>4</sub> ) <sub>3</sub> ·2H <sub>2</sub> O
0.64	23.52	0.169	3.361	
0.57	24.88	0.153	3.617	
0.43	27.52	0.122	4.14	H <sub>3</sub> K <sub>4</sub> (C <sub>2</sub> O <sub>4</sub> ) <sub>3</sub> ·2H <sub>2</sub> O + K <sub>2</sub> C <sub>2</sub> O <sub>4</sub> ·H <sub>2</sub> O
...	27.40	...	4.09	K <sub>2</sub> C <sub>2</sub> O <sub>4</sub> ·H <sub>2</sub> O

## SOLUBILITY OF POTASSIUM OXALATE AND ACID POTASSIUM OXALATE IN WATER.

(Alluard; results at 0°, Engel — Ann. chim. phys. [6] 13, 362, '88.)

100 gms. H<sub>2</sub>O dissolve 25.24 gms. K<sub>2</sub>C<sub>2</sub>O<sub>4</sub>, or 100 gms. of sat. solution contain 20.62 gms. K<sub>2</sub>C<sub>2</sub>O<sub>4</sub> at 0°. Sp. Gr. of solution = 1.161.

Acid Oxalate in Solutions of Neutral Oxalate at 0°.					Acid Oxalate in Water	
* H <sub>2</sub> SO <sub>4</sub> Corresponding to K in 10 cc. Sol.	* KOH Corresponding to Free Acid in 10 cc.	Sp. Gr. of Solutions.	Gms. per 100 cc. Sol.		t°. per 100 Gms. H <sub>2</sub> O.	Gms. KHC <sub>2</sub> O <sub>4</sub>
			K <sub>2</sub> C <sub>2</sub> O <sub>4</sub> .	H <sub>2</sub> C <sub>2</sub> O <sub>4</sub> .		
28.5	0.4	1.164	23.53	0.18	0	2.2
10.8	0.925	...	8.91	0.41	10	3.1
6.8	1.075	1.042	5.61	0.48	20	5.2
4.78	1.25	1.031	3.94	0.56	40	10.5
3.83	1.45	1.025	3.16	0.65	60	20.5
3.35	1.53	1.022	2.76	0.68	80	34.7
2.6 (1)	1.85	1.018	2.15	0.83	100	51.5
2.0 (2)	2.25	1.007	1.65	1.00		
0.45 (3)	1.25	1.004	0.37	0.56		

(1) Sat. with acid potassium oxalate.

(2) Sat. with both acid oxalate and tetroxalate.

(3) Sat. with tetroxalate.

POTASSIUM PERMANGANATE KMnO<sub>4</sub>.

## SOLUBILITY IN WATER.

(Baxter, Boylston, and Hubbard — J. Am. Ch. Soc. 28, 1343, '06; Patterson — *Ibid.* 28, 1735, '06.)

t°.	Grams KMnO <sub>4</sub> per 100:			t°.	Grams KMnO <sub>4</sub> per 100:	
	Gms. Solution.	Gms. H <sub>2</sub> O.	cc. Solution (P).		Gms. Solution.	Gms. H <sub>2</sub> O.
0	2.75	2.83	2.84	34.8	9.64	10.67
9.8	4.13	4.31	...	40	11.16	12.56
15.0	...	...	5.22	45	12.73	14.58
19.8	5.96	6.34	...	50	14.45	16.89
24.8	7.06	7.59	...	55	16.20	19.33
29.8	8.28	9.03	8.69	65	20.02	25.03

Sp. Gr. of saturated solution at 15° = 1.035.

## SOLUBILITY OF POTASSIUM PERMANGANATE IN:

## Water.

(Voerman — Chem. Centr. 77, I, 125, '06.)

## Aqueous Acetone Solutions at 13°.

(Herz and Knoch — Z. anorg. Ch. 41, 317 '04.)

t°.	Gms. KMnO <sub>4</sub> per 100 Gms.		Solid Phase.	cc. Acetone per 100 cc. Solvent.	KMnO <sub>4</sub> per 100 cc. Solution.	
	Solution.	Water.			Millimols.	Grams.
— 0.18	0.58	0.58	Ice	0	148.5	4.70
— 0.27	0.99	1.01	"	10	162.2	5.13
— 0.48	1.98	2.02	"	20	177.3	5.61
— 0.58	2.91	3.00	Ice + KMnO <sub>4</sub>	30	208.2	6.59
+ 10.0	4.01	4.22	KMnO <sub>4</sub>	40	257.4	8.14
15	4.95	5.20	"	50	289.7	9.16
25	7.00	7.53	"	60	316.8	10.02
40	10.40	11.61	"	70	328.0	10.38
50	14.35	16.75	"	80	312.5	9.89
				90	227.0	7.18
				100	67.0	2.14

# **POTASSIUM PERMANGANATE**

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## **SOLUBILITY OF MIXED CRYSTALS OF POTASSIUM PERMANGANATE AND POTASSIUM PERCHLORATE AT 7°.**

(Muthmann and Kuntze — Z. Kryst. Min. 23, 368, '94; recalculated by Fock — *Ibid.* 28, 402, '97.)

Milligram Mols. per Liter.		Grams per Liter.		Mol. per cent KMnO <sub>4</sub> in Crystals of Solid Phase.
KMnO <sub>4</sub> .	KClO <sub>4</sub> .	KMnO <sub>4</sub> .	KClO <sub>4</sub> .	
0.0	63.91	0.00	8.86	0.00
29.37	54.48	4.65	7.55	2.84
67.73	42.75	10.71	5.93	9.78
79.04	39.59	12.50	5.49	10.81
99.81	38.63	15.79	5.36	15.96
122.24	34.39	19.34	4.77	23.56
119.21	38.91	18.84	5.39	24.28
128.08	33.77	20.26	4.68	26.40
144.46	33.14	22.86	4.59	34.32
167.81	29.53	26.55	4.09	44.42
183.09	25.19	28.97	3.49	67.33
197.82	20.16	31.30	2.80	77.95
233.75	28.26	36.98	3.92	94.37
264.27	0.00	41.81	0.00	100.00

## **SOLUBILITY OF MIXED CRYSTALS OF POTASSIUM PERMANGANATE AND RUBIDIUM PERMANGANATE AT 7°.**

(Muthmann and Kuntze, calc. by Fock.)

Milligram Mols. per Liter.		Grams per Liter.		Mol. per cent KMnO <sub>4</sub> in Crystals of Solid Phase.
KMnO <sub>4</sub> .	RbMnO <sub>4</sub> .	KMnO <sub>4</sub> .	RbMnO <sub>4</sub> .	
27.04	22.69	4.28	4.64	3.50
75.00	22.22	11.84	4.54	13.75
120.26	31.29	19.03	6.40	34.29
188.30	38.98	29.80	7.97	71.45
198.36	41.29	31.39	8.44	92.50
205.76	42.50	32.56	8.69	99.47
225.12	26.00	35.61	5.32	99.32
264.27	0.00	41.81	0.00	100.00

# **POTASSIUM PHOSPHATE KH<sub>2</sub>PO<sub>4</sub> (Monobasic).**

One liter aqueous solution contains 249.9 grams at 7°.

(Muthmann and Kuntze.)

# **POTASSIUM HYPOPHOSPHATE, etc.**

## **SOLUBILITY IN WATER.**

(Salzer — Liebig's Ann. 211, 1, 82.)

Salt.	Formula.	Gms. Salt per 100 Gms. H <sub>2</sub> O.	
		Cold.	Hot.
Potassium Hypophosphate	K <sub>4</sub> P <sub>2</sub> O <sub>6</sub> .8H <sub>2</sub> O	400	...
" Hydrogen Hypophosphate	K <sub>3</sub> HP <sub>2</sub> O <sub>6</sub> .3H <sub>2</sub> O	200	...
" Di Hydrogen Hypophosphate	K <sub>2</sub> H <sub>2</sub> P <sub>2</sub> O <sub>6</sub> .3H <sub>2</sub> O	33	100
" Tri Hydrogen Hypophosphate	KH <sub>3</sub> P <sub>2</sub> O <sub>6</sub>	66.6	200
" Penta Hydrogen Hypophosphate	K <sub>3</sub> H <sub>5</sub> (P <sub>2</sub> O <sub>6</sub> ) <sub>2</sub> .2H <sub>2</sub> O	40	125
" Hydrogen Phosphite	KH <sub>2</sub> PO <sub>3</sub>	172 (20°)	...
" Hypophosphite	KH <sub>2</sub> PO <sub>2</sub>	200 (25°)	333
" Hypophosphite	KH <sub>2</sub> PO <sub>2</sub> *	14.3 (25°)	28

\* Solvent alcohol.

**POTASSIUM PHOSPHO-MOLYBDATE****POTASSIUM PHOSPHOMOLYBDATE**  $K_2PO_4 \cdot 11MoO_3 \cdot 1\frac{1}{2}H_2O$ .100 gms.  $H_2O$  dissolve 0.007 gms. at  $30^\circ$ .100 gms. aqueous 10 %  $HNO_3$  dissolve 0.204 gms. at  $30^\circ$ .

(Donk — Proc. Assoc. Official Agri. Chemists — Bull. No. 90, Bureau of Chemistry, U. S. Dept. of Agr., '05.)

**POTASSIUM SELINATE**  $K_2SeO_4$ .

## SOLUBILITY IN WATER.

$t^\circ$ .	— $20^\circ$ .	— $5^\circ$ .	+ $5^\circ$ .	$18^\circ$ .	$97^\circ$ .
Gms. $K_2SeO_4$ per 100 gms. solution	51.5	51.7	52.0	52.6	54.9

(Etard — Ann. Chim. phys. [7] 2, 530, '94.)

**POTASSIUM STANNATE**  $K_2SnO_3 \cdot 3H_2O$ .100 gms.  $H_2O$  dissolve 106.6 gms. at  $10^\circ$ , and 110.5 gms. at  $20^\circ$ .Sp. Gr. at  $10^\circ = 1.618$  at  $20^\circ = 1.627$ .

(Ordway — Am. J. Sci. [2] 40, 173, '65.)

**POTASSIUM SULPHATE**  $K_2SO_4$ .

## SOLUBILITY IN WATER.

(Mulder; Andrae — J. pr. Ch. 29, 456, '84; Trevor — Z. physik. Ch. 7, 468, 91; Tilden and Shenstone — Phil. Trans. 31, '84; Berkeley — Trans. Roy. Soc. 203 A, 209, '04; see also Etard — Ann. chim. phys. [7] 2, 549, '94.)

$t^\circ$ .	Gms. $K_2SO_4$ per 100 Gms.		$t^\circ$ .	Gms. $K_2SO_4$ per 100 Gms.		$t^\circ$ .	Gms. $K_2SO_4$ per 100 Gms.	
	Water.	Solution.		Water.	Solution.		Water.	Solution.
0	7.35	6.85	40	14.76	12.86	90	22.8	18.57
10	9.22	8.44	50	16.50	14.16	100	24.1	19.42
20	11.11	10.00	60	18.17	15.38	120	26.5	20.94
25	12.04	10.75	70	19.75	16.49	143	28.8	22.36
30	12.97	11.48	80	21.4	17.63	170	32.9	24.76

Sp. Gr. of solution saturated at  $18^\circ = 1.083$ .SOLUBILITY OF POTASSIUM SULPHATE IN AQUEOUS AMMONIA  
SOLUTIONS AT  $20^\circ$ .

(Girard — Bull. soc. chim. [2] 43, 552, '85.)

Gms. $NH_3$ per 100 cc. solution	0	6.086	15.37	24.69	31.02
Gms. $K_2SO_4$ per 100 cc. solution	10.80	4.10	0.83	0.14	0.04

SOLUBILITY OF MIXED CRYSTALS OF POTASSIUM SULPHATE AND  
AMMONIUM SULPHATE AT  $25^\circ$ .

(Fock — Z. Kryst. Min. 28, 375, '97.)

Grams per Liter.		Milligram Mols. per Liter.		Mol. per cent $K_2SO_4$ in Solution.	Sp. Gr. of Solution.	Mol. per cent $K_2SO_4$ in Solid Phase.
$K_2SO_4$ .	$(NH_4)_2SO_4$ .	$K_2SO_4$ .	$(NH_4)_2SO_4$ .			
127.9	0.0	734	0.0	100	1.086	100
135.7	115.7	778.5	874.6	47.1	1.149	91.28
84.20	281.1	483	2126	18.5	1.200	80.05
59.28	355.0	340	2685	11.13	1.226	68.63
40.27	482.7	231	3650	5.98	1.246	27.53
0.00	542.3	0.0	4100	0.00	1.245	0.00

Results are also given for  $14^\circ$ ,  $15^\circ$ ,  $16^\circ$ ,  $30^\circ$ ,  $46^\circ$ , and  $47^\circ$ .



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**SOLUBILITY OF MIXED CRYSTALS OF POTASSIUM COPPER SULPHATE AND AMMONIUM COPPER SULPHATE IN WATER.**

$\text{CuSO}_4 \cdot \text{K}_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$  and  $\text{CuSO}_4(\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$  at  $13^\circ$ – $14^\circ$ . (Fock.)

Mols. per 100 Mols. $\text{H}_2\text{O}$		Mol. per cent K Salt		Mols. per 100 Mols. $\text{H}_2\text{O}$		Mol. per cent K Salt	
K. Salt.	$\text{NH}_4$ Salt.	in Solution.	in Solid.	K Salt.	$\text{NH}_4$ Salt.	in Solution.	in Solid.
0.00	1.035	0.00	0.00	0.2946	0.5096	36.63	58.20
0.0897	0.8618	5.06	10.34	0.3339	0.3319	50.15	75.34
0.2269	0.6490	16.76	33.05	0.4560	0.1961	69.93	83.86
0.2570	0.5887	30.40	46.22	0.4374	0.00	100.00	100.00

**SOLUBILITY OF SOME POTASSIUM DOUBLE SULPHATES IN WATER AT  $25^\circ$ .**

(Locke — Am. Ch. J. 27, 459, '01.)

Double Salt.	Formula.	Gms. Anhydrous Salt per 100 Gms. $\text{H}_2\text{O}$ .
Potassium Cobalt Sulphate	$\text{K}_2\text{CO}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$	12.88
“ Copper “	$\text{K}_2\text{Cu}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$	11.69
“ Nickel “	$\text{K}_2\text{Ni}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$	6.88
“ Zinc “	$\text{K}_2\text{Zn}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$	13.19

**SOLUBILITY OF POTASSIUM NICKEL SULPHATE AND ALSO OF POTASSIUM ZINC SULPHATE IN WATER AT DIFFERENT TEMPERATURES.**

$t^\circ$ .	Grams per 100 Gms. $\text{H}_2\text{O}$ .		$t^\circ$ .	Grams per 100 Grams $\text{H}_2\text{O}$ .	
	$\text{K}_2\text{Ni}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$ .	$\text{K}_2\text{Zn}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$ .		$\text{K}_2\text{Ni}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$ .	$\text{K}_2\text{Zn}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$ .
0	6	13	40	23	45
10	9	19	50	28	56
20	14	26	60	35	72
25	16	30	70	43	88
30	18	35			

**SOLUBILITY OF THE THREE HYDRATES OF POTASSIUM FERRO SULPHATE IN WATER AT DIFFERENT TEMPERATURES.**

(Kuster and Thiel — Z. anorg. Ch. 21, 116, '99.)

$t^\circ$ .	$\text{K}_2\text{SO}_4 \cdot \text{FeSO}_4 \cdot 6\text{H}_2\text{O}$ .		$\text{K}_2\text{SO}_4 \cdot \text{FeSO}_4 \cdot 4\text{H}_2\text{O}$ .		$\text{K}_2\text{SO}_4 \cdot \text{FeSO}_4 \cdot 2\text{H}_2\text{O}$ .	
	cc. N/10 $\text{KMnO}_4$ per 2cc. Solution.	Gms. $\text{K}_2\text{SO}_4 \cdot \text{FeSO}_4$ per 100 cc. Sol.	cc. N/10 $\text{KMnO}_4$ per 2 cc. Solution.	Gms. $\text{K}_2\text{SO}_4 \cdot \text{FeSO}_4$ per 100 cc. Sol.	cc. N/10 $\text{KMnO}_4$ per 2 cc. Solution.	Gms. $\text{K}_2\text{SO}_4 \cdot \text{FeSO}_4$ per 100 cc. Sol. <sup>4</sup>
0.5	12.4	18.36	15.5	22.94	15.4	22.79
17.2	17.0	25.16	18.1	26.79	21.6	31.98
40.1	24.8	36.72	21.9	32.41	27.6	40.86
60	29.0	42.93	24.1	35.68	28.8	42.63
80	30.6	45.29	27.3	40.46	28.6	42.34
90	...	...	29.6	43.82	28.9	42.73
95	...	...	29.8	44.11	27.7	41.01

## SOLUBILITY OF POTASSIUM SULPHATE IN AQUEOUS SOLUTIONS OF POTASSIUM CHLORIDE, BROMIDE, AND IODIDE.

(Blarez — Compt. rend. 112, 939, '91.)

Interpolated from the original results.

Grams Halogen Salt per 100 cc. Solution.	Grams $K_2SO_4$ per 100 cc. in Aq. Solutions of:		
	KCl at 12.5°.	KBr at 14°.	KI at 12.5°.
0	9.9	10.16	9.9
2	8.3	9.1	9.2
4	7.0	8.2	8.4
6	5.7	7.4	7.7
8	4.6	6.6	7.2
10	3.5	6.0	6.6
12	...	5.5	6.0

## SOLUBILITY OF MIXED CRYSTALS OF POTASSIUM SULPHATE AND POTASSIUM CHROMATE AT 25°.

(Fock — Z. Kryst. Min. 28, 379, '97.)

Milligram Mols. per Liter.		Grams per Liter.		Mol. per cent $K_2SO_4$ in Solution.	Sp. Gr. of Solution.	Mol. per cent $K_2SO_4$ in Solid Phase.
$K_2SO_4$ .	$K_2CrO_4$ .	$K_2SO_4$ .	$K_2CrO_4$ .			
618.1	0.0	107.7	0.00	100.0	1.083	100.0
608.4	103	106.0	20.02	85.51	1.092	99.65
341.0	691.8	59.46	134.5	33.01	1.141	97.30
174.8	1496.0	30.47	290.5	10.50	1.231	91.97
110.7	2523	19.30	490.5	4.21	1.356	28.43
100.6	2687	17.54	522.3	3.60	1.377	2.41
0.0	2847	0.0	553.5	0.00	1.398	0.00
734.0	0.0	127.9	0.0	100.0	1.0863	100.0
617.0	103.4	107.6	20.1	85.65	1.0934	99.78
463	452.7	80.72	88.0	55.55	1.1235	98.49
279	948.2	48.64	184.4	22.72	1.1700	96.07
153	1469	26.68	285.6	9.41	1.2255	85.77
296	2681	51.61	521.2	21.09	1.3688	25.73
0.0	2715	0.00	527.8	0.00	1.3781	0.00

## SOLUBILITY OF POTASSIUM SODIUM SULPHATES IN WATER.

Double Salt.	t°.	Gms. per 100 Gms. $H_2O$ .	Authority.
$3K_2SO_4 \cdot Na_2SO_4$	103.5	40.8	(Penny — Phil. Mag. [4] 10, 401, '55.)
$5K_2SO_4 \cdot Na_2SO_4$	4.4	9.2	(Gladstone — J. Ch. Soc. 6, 11, '84.)
"	12.7	10.1	"
"	100.0	25.0	"

# **POTASSIUM SULPHATE** 264

## **SOLUBILITY OF POTASSIUM SULPHATE IN AQUEOUS ALCOHOL.**

(Gerardin — Ann. chim. phys. [4] 5, 147, '65; Schiff — Liebig's Ann. 118, 362, '61.)

In Aq. Alcohol of 0.939 Sp. Gr.=40 Wt. %.		In Alcohol of Different Strengths at 15°.	
t°.	Gms. K <sub>2</sub> SO <sub>4</sub> per 100 Gms. Alcohol.	Weight per cent Alcohol.	Gms. K <sub>2</sub> SO <sub>4</sub> per 100 Gms. Sat. Sol.
40	0.16	10	3.90
80	0.21	20	1.46
60	0.92	30	0.56
		40	0.21

100 gms. glycerine of 1.255 Sp. Gr. dissolve 1.316 gms. K<sub>2</sub>SO<sub>4</sub> at ord. temp.  
(Vogel — Neues Report. Pharm. 16, 557 '67.)

## **SOLUBILITY OF POTASSIUM SULPHATE IN AQUEOUS ACETIC ACID AND IN AQUEOUS PHENOL SOLUTIONS AT 25°.**

(Rothmund and Wilsmore — Z. physik. Ch. 40, 619, '02.)

In Aq. Acetic Acid.				In Aq. Phenol.			
Mols. per Liter.		Grams per Liter.		Mols. per Liter.		Grams per Liter.	
CH <sub>3</sub> COOH.	K <sub>2</sub> SO <sub>4</sub> .	CH <sub>3</sub> COOH.	K <sub>2</sub> SO <sub>4</sub> .	C <sub>6</sub> H <sub>5</sub> OH.	K <sub>2</sub> SO <sub>4</sub> .	C <sub>6</sub> H <sub>5</sub> OH.	K <sub>2</sub> SO <sub>4</sub> .
0.0	0.6714	0.0	117.0	0.0	0.6714	0.0	117.0
0.07	0.6619	4.2	115.4	0.032	0.6598	3.01	115.0
0.137	0.6559	8.22	114.4	0.064	0.6502	6.02	113.3
0.328	0.6350	19.68	110.8	0.127	0.6310	11.94	110.0
0.578	0.6097	34.68	106.3	0.236	0.6042	22.19	105.3
1.151	0.5556	69.06	96.87	0.308	0.5834	28.97	101.7
2.183	0.4743	128.58	82.70	0.409	0.5572	38.46	97.2
				0.464	0.5480	43.63	95.5
				0.498 (sat.)	0.5377	46.82	93.8

100 grams water dissolve 10.4 grams K<sub>2</sub>SO<sub>4</sub> + 219.0 grams sugar at 31.25°, or 100 grams sat. solution contain 3.18 grams K<sub>2</sub>SO<sub>4</sub> + 66.74 grams sugar.  
(Köhler — Z. Ver. Zuckerind. 47, 447, '97.)

## **POTASSIUM ACID SULPHATE KHSO<sub>4</sub>.**

### **SOLUBILITY IN WATER.**

(Kremers — Liebig's Ann. 92, 497, '54.)

t°	0°	20°	40°	100°
Gms. KHSO <sub>4</sub> per 100 gms. H <sub>2</sub> O	36.3	51.4	67.3	121.6

## **POTASSIUM PERSULPHATE K<sub>2</sub>S<sub>2</sub>O<sub>8</sub>.**

100 gms. H<sub>2</sub>O dissolve 1.77 gms. K<sub>2</sub>S<sub>2</sub>O<sub>8</sub> at 0°.

(Marshall — J. Ch. Soc. 59, 771, '91.)

## **POTASSIUM SODIUM THIOSULPHATE KNaS<sub>2</sub>O<sub>3</sub>.2H<sub>2</sub>O.**

## **POTASSIUM SODIUM HYDROGEN SULPHITE KNa<sub>2</sub>H(SO<sub>3</sub>)<sub>2</sub>.4H<sub>2</sub>O.**

100 grams H<sub>2</sub>O dissolve 213.7 grams KNaS<sub>2</sub>O<sub>3</sub>.2H<sub>2</sub>O (a) at 15°.

100 grams H<sub>2</sub>O dissolve 205.3 grams KNaS<sub>2</sub>O<sub>3</sub>.2H<sub>2</sub>O (b) at 15°.

100 grams H<sub>2</sub>O dissolve 69.0 grams KNa<sub>2</sub>H(SO<sub>3</sub>)<sub>2</sub>.4H<sub>2</sub>O at 15°.

(Schwicker — Ber. 22, 1731, '89.)

## POTASSIUM SULPHOCYANIDE KSCN.

100 grams  $H_2O$  dissolve 177.2 grams KSCN at  $0^\circ$ , and 217.0 grams at  $20^\circ$ .

(Rüdorff — Ber. 2, 68, '69.)

SOLUBILITY OF POTASSIUM SULPHOCYANIDE IN ACETONE, AMYL  
ALCOHOL, ETC.

(von Laszcynski — Ber. 27, 2285, '94.)

In Acetone.		In Amyl Alcohol.		In Ethyl Acetate.		In Pyridine.	
$t^\circ$ .	Gms. KSCN per 100 Gms. $(CH_3)_2CO$ .	$t^\circ$ .	Gms. KSCN per 100 Gms. $C_5H_{11}OH$ .	$t^\circ$ .	Gms. KSCN per 100 Gms. $CH_3COOC_2H_5$ .	$t^\circ$ .	Gms. KSCN per 100 Gms. $C_5H_5N$ .
22	20.75	13	0.18	0	0.44	0	6.75
58	20.40	65	1.34	14	0.40	20	6.15
		100	2.14	79	0.20	58	4.97
		133.5	3.15			97	3.88
						115	3.21

POTASSIUM (Bi) TARTRATE (Mono)  $KHC_4H_4O_6$ , Cream of Tartar.

## SOLUBILITY OF MONO POTASSIUM TARTRATE IN WATER.

(Alluard — Liebig's Ann. 133, 292, '65; Roelofsens — Am. Ch. J. 16, 466, '94; Blarez — Compt. rend. 112, 434, '91; at  $20^\circ$ , Magnanini — Gazz. chim. ital. 31, II, 542, '01; at  $25^\circ$ , Noyes and Clement — Z. physik. Ch. 13, 413, '94.)

$t^\circ$ .	Gms. $KHC_4H_4O_6$ per 100 Gms. Solution.			$t^\circ$ .	Gms. $KHC_4H_4O_6$ per 100 Gms. Solution.		
0	0.30 (R.)	0.32 (A.)	0.35 (B.)	40	0.96	1.3	1.29
10	0.37	0.40	0.42	50	1.25	1.8	1.80
20	0.49	0.53 (M.)	0.60	60	....	2.4	....
25	0.58	0.654 (N. and C.)	0.74	80	....	4.4	....
30	0.69	0.9 (A.)	0.89	100	....	6.5	....

SOLUBILITY OF POTASSIUM ACID TARTRATE ( $KHC_4H_4O_6$ ) IN NORMAL  
SOLUTIONS OF ACIDS AT  $20^\circ$ .

(Ostwald; Huecke — J. pr. Ch. [2] 29, 49, '84.)

Purified tartrate was added in excess to normal solutions of the acids, and after shaking clear 1 cc. portions of each solution were withdrawn and titrated with approximately  $N/10$   $Ba(OH)_2$  solution; 1 cc. normal acid requiring 10.63 cc. of the  $Ba(OH)_2$  solution.

Acid.	Gms. Acid per 100 cc. Solvent.	cc. $N/10$ $Ba(OH)_2$ per 1 cc. Solution.	Gms. $KHC_4H_4O_6$ per 100 cc. Solution.	Acid.	Gms. Acid per 100 cc. Solvent.	cc. $N/10$ $Ba(OH)_2$ per 1 cc. Solution.	Gms. $KHC_4H_4O_6$ per 100 cc. Solution.
$HNO_3$	6.31	5.77*	10.21	$C_2H_5SO_3H$	11.0	5.01*	8.87
$HCl$	3.65	5.32	9.42	$HO.(CH_2)_2SO_3H$	12.61	5.33	9.43
$HBr$	8.10	5.38	9.75	$C_2H_5SO_3H$	15.81	5.25	9.29
$HI$	12.80	5.43	9.61	$HCOOH$	4.60	0.45	0.80
$H_2SO_4$	4.90	3.97	7.03	$CH_3COOH$	6.00	0.27	0.48
$HCH_2SO_4$	11.21	5.58	12.44	$CH_2ClCOOH$	9.45	1.01	1.79
$HC_2H_3SO_4$	12.61	5.41	9.58	$C_2H_5COOH$	7.40	0.24	0.42
$HC_2H_3SO_4$	14.01	5.21	9.22	$C_2H_5COOH$	8.81	0.23	0.41

\* The figures in this column show the amount of the  $Ba(OH)_2$  solution in excess of that which would have been required by the normal acid solution alone in each case, viz., 10.63 cc. They, therefore, correspond to the amount of  $KHC_4H_4O_6$  dissolved in 1 cc. of each saturated solution, and when multiplied by 1.77 give the grams of  $KHC_4H_4O_6$  per 100 cc. solution.

# **POTASSIUM TARTRATE.** 266

## **SOLUBILITY OF MONO POTASSIUM TARTRATE ( $\text{KHC}_4\text{H}_4\text{O}_6$ ) IN AQUEOUS SOLUTIONS OF ELECTROLYTES AT 25°.**

(Noyes and Clement — Z. physik. Ch. 13, 413, '94; Magnanini — Gazz. chim. ital. 31, II, 542, '01.)

Electro-lyte.	Gms. Equiv. per Liter.		Gms. per 100 cc.		Electro-lyte.	Gm. Equiv. per Liter.		Grams per 100 cc.	
	Electro-lyte.	$\text{KHC}_4\text{H}_4\text{O}_6$	Electro-lyte.	$\text{KHC}_4\text{H}_4\text{O}_6$		Electro-lyte.	$\text{KHC}_4\text{H}_4\text{O}_6$	Electro-lyte.	$\text{KHC}_4\text{H}_4\text{O}_6$
KCl	0.025	0.0254	1.86	0.4788	$\text{CH}_3\text{COOK}$	0.05	0.0410	4.91	0.7718
"	0.05	0.0196	3.73	0.3680	"	0.10	0.0504	9.82	0.9486
"	0.10	0.0133	7.46	0.2509	"	0.20	0.0634	19.63	1.1930
"	0.20	0.0087	14.92	0.1636	$\text{KHSO}_4$ (20°)	0.01	0.0375	1.36	0.706
$\text{KClO}_3$	0.025	0.0256	3.06	0.4821	"	0.02	0.0500	2.72	0.941
"	0.05	0.0197	6.13	0.3716	"	0.10	0.1597	13.62	3.006
"	0.10	0.0138	12.26	0.2601	$\text{KHC}_2\text{O}_4^*$ (20°)	0.01	0.0369	1.28	0.694
"	0.20	0.0092	24.52	0.1728	"	0.02	0.0424	2.56	0.798
KBr	0.05	0.0197	5.95	0.3699	"	0.10	0.1132	12.82	2.130
"	0.10	0.0134	11.91	0.2517	HCl	0.013	0.0367	0.45	0.690
"	0.20	0.0087	23.82	0.1629	"	0.025	0.0428	0.91	0.806
KI	0.05	0.0196	8.30	0.3687	"	0.050	0.0589	1.82	1.109
"	0.10	0.0132	16.61	0.2492	NaCl	0.05	0.0376	2.92	0.708
"	0.20	0.0086	33.22	0.1619	"	0.10	0.0397	5.85	0.748
$\text{KNO}_3$	0.05	0.0195	5.06	0.3676	"	0.20	0.0428	11.70	0.805
"	0.10	0.0136	10.12	0.2551	$\text{NaClO}_3$	0.05	0.0382	5.32	0.718
"	0.20	0.0090	20.24	0.1696	"	0.10	0.0405	10.65	0.763
$\text{K}_2\text{SO}_4$	0.05	0.0208	4.36	0.3921	"	0.20	0.0446	21.30	0.840
"	0.10	0.0147	8.72	0.2769	* Acid potassium oxalate.				
"	0.20	0.0100	17.44	0.1881					

## **SOLUBILITY OF MONO POTASSIUM TARTRATE IN AQUEOUS ALCOHOL SOLUTIONS.**

(Roelofsens — Am. Ch. J. 16, 466, '94; Wenger — *Ibid.* 14, 624, '92.)

NOTE. — The original results were plotted on cross-section paper and the following figures read from the curves.

t°.	Milligrams $\text{KHC}_4\text{H}_4\text{O}_6$ per 10 cc. of Aq. Alcohol of:					
	10 per cent.	20 per cent.	30 per cent.	40 per cent.	60 per cent.	80 per cent.
0	17	11	7	6	6	6
10	22	14	8	7	6	6
20	29	18	11	8	6	6
25	34	21	12	9.5	6.5	5.5
30	40	25	13	11	7	5.5
40	55	36	19	14	7.5	5
50	87	55	29	19	8	5

# **POTASSIUM FLUO TITANATE $\text{K}_2\text{TiF}_6\cdot\text{H}_2\text{O}$ .**

## **SOLUBILITY IN WATER.**

(Marignac — Ann. chim. phys. [4] 8, 65, '66.)

t°	0°	3°	6°	10°	14°	20°
Gms. $\text{K}_2\text{TiF}_6$ per 100 gms. $\text{H}_2\text{O}$	0.55	0.67	0.77	0.91	1.04	1.28

**POTASSIUM VANADATE**  $K_2V_2O_7 \cdot 5H_2O$ .100 grams  $H_2O$  dissolve 19.2 grams at  $17.5^\circ$ .

(Radan — Liebig's Ann. 251, 120, '89.)

**POTASSIUM ZINC VANADATE**  $KZnV_2O_7 \cdot 8H_2O$ .100 grams  $H_2O$  dissolve 0.41 gram of the salt (Radan).**PRASEODYMIUM SULPHATE**  $Pr_2(SO_4)_3$ .

## SOLUBILITY IN WATER.

(Muthmann and Rölig — Ber. 31, 1727, '98.)

t°.	Gms. $Pr_2(SO_4)_3$ per 100 Gms.		Solid Phase.	t°.	Gms. $Pr_2(SO_4)_3$ per 100 Gms.		Solid Phase.
	Solution.	Water.			Solution.	Water.	
0	16.5	19.8	$Pr_2(SO_4)_3 \cdot 8H_2O$	75	4.0	4.2	$Pr_2(SO_4)_3 \cdot 8H_2O$
18	12.3	14.1	"	85	1.5	1.55	$Pr_2(SO_4)_3 \cdot 8H_2O$ + $Pr_2(SO_4)_3 \cdot 5H_2O$
35	9.4	10.4	"				
55	6.6	7.1	"	95	1.0	1.01	$Pr_2(SO_4)_3 \cdot 5H_2O$

**PROPIONIC ALDEHYDE**  $C_2H_5COH$ .100 grams  $H_2O$  dissolve 16 grams aldehyde at  $20^\circ$ .

(Vaubel — J. pr. Ch. 59, 30, '99.)

**PROPIONITRIL**  $C_2H_5CN$ .

## SOLUBILITY IN WATER.

Synthetic method used. See Note, page 9.

(Rothmund — Z. physik. Ch. 26, 474, '98.)

t°.	Wt. per cent $C_2H_5CN$ in:		t°.	Wt. per cent $C_2H_5CN$ in:	
	Aq. Layer.	$C_2H_5CN$ Layer.		Aq. Layer.	$C_2H_5CN$ Layer.
40	10.7	92.1	95	19.6	78.0
50	11.6	90.5	100	22.4	75.5
60	12.7	88.5	105	26.0	72.1
70	13.2	86.1	110	32.0	66.5
80	14.9	83.4	113.1 (crit. temp.)	48.3	
90	17.6	80.2			

**PROPYL ACETATE**, Butyrate and Propionate.

## SOLUBILITY OF EACH IN AQUEOUS ALCOHOL MIXTURES.

(Bancroft — Phys. Rev. 3, 205, '95, calc. from Pfeiffer.)

cc. Alco- hol in Mixture.	cc. $H_2O$ Added to Cause Separation* in:			cc. Alco- hol in Mixture.	cc. $H_2O$ Added to cause Separation* in:		
	P. Ace- tate.	P. Buty- rate.	P. Propio- nate.		P. Ace- tate.	P. Buty- rate.	P. Propio- nate.
3	4.50	1.19	1.58	21	58.71	19.68	27.83
6	10.48	3.55	4.70	24	∞	23.72	33.75
9	17.80	6.13	8.35	30		32.10	47.15
12	26.00	9.05	12.54	36		41.55	63.18
15	35.63	12.31	17.15	42		51.60	83.05
18	47.50	15.90	22.27	48		62.40	107.46
				54		73.85	...

\* cc.  $H_2O$  added to cause the separation of a second phase in mixtures of the given amounts of alcohol and 3 cc. portions of propyl acetate, butyrate and propionate.

**PROPYL ACETATE**

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**SOLUBILITY OF PROPYL ACETATE, FORMATE, AND PROPIONATE  
IN WATER.**100 cc. H<sub>2</sub>O dissolve 1.7 gms. propyl acetate at 22°.100 cc. H<sub>2</sub>O dissolve 2.1 gms. propyl formate at 22°.

(Traube — Ber. 17, 2304, '84.)

100 cc. H<sub>2</sub>O dissolve 0.6 cc. propyl propionate at 25°.

(Bancroft.)

**PROPYL CHLORIDE, Bromide, etc.****SOLUBILITY IN WATER.**

(Rex — Z. physik. Ch. 55, 355, '06.)

Propyl Compound.	Grams P. Compound per 100 Gms. H <sub>2</sub> O at:			
	0°.	10°.	20°.	30°.
CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> Cl (normal)	0.376	0.323	0.272	0.277
CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> Br “	0.298	0.263	0.245	0.247
CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> I “	0.114	0.103	0.107	0.103
(CH <sub>3</sub> ) <sub>2</sub> CHCl (iso)	0.440	0.363	0.305	0.304
(CH <sub>3</sub> ) <sub>2</sub> CHBr “	0.418	0.365	0.318	0.318
(CH <sub>3</sub> ) <sub>2</sub> CHI “	0.167	0.143	0.140	0.134

**PROPYLENE C<sub>3</sub>H<sub>6</sub>. SOLUBILITY IN WATER.**

(Than — Liebig's Ann. 123, 187, '62.)

t°.	β.	q.
0	0.4465	0.0834
5	0.3493	0.06504
10	0.2796	0.0519
15	0.2366	0.0437
20	0.2205	0.0405

For values of β and q, see Ethane, page 133.

**PYRENE C<sub>16</sub>H<sub>10</sub>****SOLUBILITY IN TOLUENE AND IN ABSOLUTE ALCOHOL.**

100 gms. toluene dissolve 16.54 gms. pyrene at 18°.

100 gms. absolute alcohol dissolve 1.37 gms. pyrene at 10° and 3.08 gms. at b. pt.

**PYROGALLOL C<sub>6</sub>H<sub>3</sub>(OH)<sub>3</sub>, 1, 2, 3.****SOLUBILITY IN WATER, ETC.**

(U. S. P.)

100 gms. water dissolve 62.5 gms. C<sub>6</sub>H<sub>3</sub>(OH)<sub>3</sub> at 25°.100 gms. alcohol dissolve 100.0 gms. C<sub>6</sub>H<sub>3</sub>(OH)<sub>3</sub> at 25°.100 gms. ether dissolve 90.9 gms. C<sub>6</sub>H<sub>3</sub>(OH)<sub>3</sub> at 25°.

**QUININE**  $C_{20}H_{24}N_2O_2$ . (See also Cinchona alkaloids, p. 117.)

**SOLUBILITY OF QUININE AND OF QUININE SALTS IN WATER AND OTHER SOLVENTS.**

(U. S. P.)

Compound.	Grams. Quinine Compound per 100 Grams Solvent in:					
	Water.		Alcohol.	Ether.	Chloroform.	Glycerine.
	At 25°.	At 80°.	At 25°.	At 25°.	At 25°.	At 25°.
$C_{20}H_{24}N_2O_2$	0.057	0.123	166.6	22.2	52.6	0.633
$C_{20}H_{24}N_2O_2 \cdot 3H_2O$	0.065	0.129	166.6	76.9	62.5	0.472
$C_{20}H_{24}N_2O_2 \cdot HCl \cdot H_2O$	5.55	250.0	166.6	0.417	122.0	12.2
$C_{20}H_{24}N_2O_2 \cdot 2C_6H_4(OH) \cdot COOH \cdot H_2O$	1.30	2.86	9.09	0.91	2.70	6.25
$(C_{20}H_{24}N_2O_2)_2 \cdot H_2SO_4 \cdot 7H_2O$	0.139	2.22	1.16	....	0.25	2.78
$C_{20}H_{24}N_2O_2 \cdot H_2SO_4 \cdot 7H_2O$	11.77	117.7	5.55	0.056	0.109	5.55
$C_{20}H_{24}N_2O_2 \cdot HBr \cdot H_2O$	2.5	33.3	149.2	6.2	...	12.5

**SOLUBILITY OF QUININE IN AQUEOUS SOLUTIONS OF CAUSTIC ALKALIES.**

(Dourner and Deraux — J. pharm. chim. [6] 1, 50, '95.)

**METHOD.** — A one per cent solution of quinine sulphate containing a very small amount of HCl was gradually added to 200 cc. portions of the caustic alkali solutions of the various concentrations stated, and the point noted at which a precipitate of the appearance corresponding to that of 1 cc. of milk in 100 cc. of water, remained undissolved.

In Aq. Ammonia.		In Aq. Sodium Hydrate.		In Aq. Pot. Hydrate.	
Gms. $NH_3$ per 200 cc. Solution.	Gms. Anhydrous Quinine Dissolved.	Gms. NaOH per 200 cc. Solution.	Gms. Anhydrous Quinine Dissolved.	Gms. KOH per 200 cc. Solution.	Gms. Anhydrous Quinine Dissolved.
0.52	0.084	0.007	0.092	0.612	0.088
0.65	0.084	0.012	0.091	1.512	0.082
4.59	0.096	0.740	0.090	3.456	0.068
13.08	0.122	2.160	0.079	10.944	0.039
18.88	0.144	3.188	0.056	44.704	0.006
25.19	0.174	6.172	0.044		
35.79	0.184	8.537	0.021		
		17.074	0.015		

**SOLUBILITY OF QUININE SALTS IN WATER.**

(Regnault and Willejean — Chem. Centralb. 18, 252, '87.)

Salt.	t°.	Gms. Salt per 100 Gms. $H_2O$ .	Salt.	t°.	Gms. Salt per 100 Gms. $H_2O$ .
Brom Hydrate (basic)	14	2.06	Salicylate (basic)	15	0.114
" (neutral)	12	12.33	Sulphate "	14	0.139
" "	14	13.19	" "	16	0.153
" "	16	14.79	" "	18	0.160
" "	15	14.20	" (neutral)	15	8.50
Chlor Hydrate (basic)	12	3.80	" "	17	8.90
" "	14	4.14	" "	18	9.62
" "	15	4.25	Valerate (basic)	12-16	2.59
Lactate	15	10.03			
"	37	16.18			



# RESORCINOL.

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## RESORCINOL $C_6H_4(OH)_2$ , 1, 3.

### SOLUBILITY IN:

t°.	Water.			Ethyl Alcohol.		
	(Speyers — Am. J. Sci. [4] 14, 294, '02.)			(Speyers.)		
	Sp. Gr. of Solutions.	Gms. $C_6H_4(OH)_2$ per 100 Gms.		Sp. Gr. of Solutions.	Gms. $C_6H_4(OH)_2$ per 100 Gms.	
		Water.	Solution.		Alcohol.	Solution.
0	1.101	60	37.5	1.033	210	67.8
10	1.118	81	44.8	1.036	223	69.0
20	1.134	103	50.7	1.041	236	70.3
25	1.142	117	53.9	1.045	243	70.8
30	1.148	131	56.7	1.048	250	71.4
40	1.157	161	58.9	1.056	266	72.7
50	1.165	198	66.5	1.065	286	74.1
60	1.172	246	71.1	1.075	311	75.7
70	1.176	320	76.2	1.087	341	77.3
80	1.179	487	82.9	1.104	375	78.9

NOTE. — The original results of Speyers are given in terms of mols. per 100 mols.  $H_2O$ .

According to Vaubel, 100 gms.  $H_2O$  dissolve 175.5 gms.  $C_6H_4(OH)_2$ , or 100 gms. sat. solution contain 63.7 gms. at 20°. Sp. Gr. of sol. = 1.1335.

(J. pr. Ch. [2] 52, 73, '95.)

### SOLUBILITY OF RESORCINOL IN BENZENE.

(Rothmund — Z. physik. Ch. 26, 475, '98.)

Synthetic method used. See Note, p. 9.

t°.	Gms. $C_6H_4(OH)_2$ per 100 Gms.		t°.	Gms. $C_6H_4(OH)_2$ per 100 Gms.	
	$C_6H_6$ Layer.	$C_6H_4(OH)_2$ Layer.		$C_6H_6$ Layer.	$C_6H_4(OH)_2$ Layer.
60	4.8	79.4	90	13.0	71.3
70	6.6	77.5	100	19.5	65.7
80	9.2	75.0	105	24.6	60.7
			109.3 (crit. temp.)	42.4	

### DISTRIBUTION OF RESORCINOL BETWEEN WATER AND ORGANIC SOLVENTS AT ORDINARY TEMPERATURE.

(Vaubel — J. pr. Ch. [2] 67, 478, '03.)

Gms. $C_6H_4(OH)_2$ Used.	Solvents.		Gms. $C_6H_4(OH)_2$ in:	
			$H_2O$ Layer.	Organic Solvent Layer.
1.191	60 cc. $H_2O$ +	30 cc. Ether	0.2014	0.9896
1.191	60 cc. $H_2O$ +	60 cc. Ether	0.2475	0.9525
0.800	40 cc. $H_2O$ +	40 cc. Benzene	0.5873	0.2127
0.800	40 cc. $H_2O$ +	80 cc. Benzene	0.5773	0.2227
0.500	50 cc. $H_2O$ +	50 cc. $CCl_4$	0.4885	0.0115
0.500	50 cc. $H_2O$ +	100 cc. $CCl_4$	0.4880	0.0120
0.500	50 cc. $H_2O$ +	150 cc. $CCl_4$	0.4880	0.0120

### RHODIUM SALTS. SOLUBILITY IN WATER.

(Jorgensen — J. pr. Ch. [2] 27, 433, '83; 34, 394, '86; 44, 51, '91.)

Salt.	Formula.	t°.	Gms. per 100 Gms. $H_2O$
Chloro Purpureo Rhodium Chloride	$ClRh(NH_2)_2Cl_2$	17	0.56
Luteo Rhodium Chloride	$Rh(NH_2)_2Cl_2$	8	13.3
Luteo Rhodium Nitrate	$Rh(NH_2)_2(NO_2)_2$	ord. t.	2.1
Luteo Rhodium Sulphate	$[Rh(NH_2)_2]_2(SO_4)_3 \cdot 5H_2O$	20	2.3

**RUBIDIUM ALUMS.****SOLUBILITY IN WATER.**

(Locke — Am. Ch. J. 27, 174, '01.)

Alum.	Formula.	t°.	Gms. Alum per 100 Gms. H <sub>2</sub> O.		
			Anhydrous.	Hydrated.	G. Mols.
Rb. Aluminum Alum	RbAl(SO <sub>4</sub> ) <sub>2</sub> ·12H <sub>2</sub> O	25	1.81	3.15	0.0059
"	"	30	2.10	...	0.0072
"	"	35	2.66	...	0.0087
"	"	40	3.22	...	0.0106
Rb. Chromium Alum	RbCr(SO <sub>4</sub> ) <sub>2</sub> ·12H <sub>2</sub> O	25	2.57	4.34	0.0079
"	"	30	3.17	...	0.0096
"	"	35	4.11	...	0.0128
"	"	40	5.97	...	0.0181
Rb. Vanadium Alum	RbV(SO <sub>4</sub> ) <sub>2</sub> ·12H <sub>2</sub> O	25	5.79	9.93	0.0177
Rb. Iron Alum	RbFe(SO <sub>4</sub> ) <sub>2</sub> ·12H <sub>2</sub> O	25	9.74	16.98	0.0294
"	"	30	20.24	...	0.0617

Biltz and Wilke (Z. anorg. Ch. 48, 299, '06) find for the solubility of rubidium iron alum in water, at 6.6°, 4.55 gms. per 100 cc. solution; at 25°, 29.0 gms.; and at 40°, 52.6 gms.

**RUBIDIUM FLUOBORIDE RbBF<sub>4</sub>.**

100 gms. H<sub>2</sub>O dissolve 0.55 gm. RbBF<sub>4</sub> at 20°, and 1.0 gram at 100°.  
(Godeffroy — Ber. 9, 1337, '76.)

**RUBIDIUM BROMIDE RbBr.****SOLUBILITY IN WATER.**

(Rimbach — Ber. 38, 1557, '05.)

t°.	Gms. RbBr per 100 Gms.		t°.	Gms. RbBr per 100 Gms.	
	Water.	Solution.		Water.	Solution.
0.5	89.6	47.26	39.7	131.85	56.87
5.0	98.0	49.50	57.5	152.47	60.39
16.0	104.8	51.17	113.5	205.21	67.24

**RUBIDIUM CARBONATE Rb<sub>2</sub>CO<sub>3</sub>.**

100 gms. absolute alcohol dissolve 0.74 gm. Rb<sub>2</sub>CO<sub>3</sub>.

(Bunsen.)

**RUBIDIUM CHLORATE RbClO<sub>4</sub>.****SOLUBILITY IN WATER.**

(Reissig — Liebig's Ann. 127, 33, '63.)

t°.	Gms. RbClO <sub>4</sub> per 100 grams H <sub>2</sub> O		t°.	Gms. RbClO <sub>4</sub> per 100 grams H <sub>2</sub> O	
	Water.	Solution.		Water.	Solution.
4.7°.	2.8	3.9	13.0°.	4.9	5.1
18.2°.			19.0°.		

**RUBIDIUM (Per) CHLORATE RbClO<sub>4</sub>.**

100 grams H<sub>2</sub>O dissolve 1.08 grams RbClO<sub>4</sub> at 21.3°.

(Longuimine — Liebig's Ann. 121, 123, '62.)

**RUBIDIUM CHLORIDE**

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**RUBIDIUM CHLORIDE RbCl.****SOLUBILITY IN WATER.**

(Rimbach — Ber. 35, 1304, '02; Berkeley — Trans. Roy. Soc. (Lond.) 203 A, 207, '04.)

t°.	Mols. RbCl per Liter.	Gms. RbCl per 100 Gms. Water.	Gms. Solution.	t°.	Mols. RbCl per Liter.	Gms. RbCl per 100 Gms. Water.	Gms. Solution.
0	5.17	77.0	43.5	60	6.90	115.5	53.6
10	5.55	84.4	45.8	70	7.12	121.4	54.8
20	5.88	91.1	47.7	80	7.33	127.2	56.0
30	6.17	97.6	49.4	90	7.52	133.1	57.1
40	6.43	103.5	50.9	100	7.71	138.9	58.9
50	6.67	109.3	52.2	112.9	7.95	146.6	59.5

**RUBIDIUM TELLURIUM CHLORIDE Rb<sub>2</sub>TeCl<sub>6</sub>.**100 gms. Aq. HCl of 1.2 Sp. Gr. dissolve 0.34 gm. Rb<sub>2</sub>TeCl<sub>6</sub> at 23°.100 gms. Aq. HCl of 1.05 Sp. Gr. dissolve 13.09 gms. Rb<sub>2</sub>TeCl<sub>6</sub> at 23°.  
(Wheeler — Am. J. Sci. [3] 45, 267, '93.)**RUBIDIUM THALLIUM CHLORIDE 3RbClTiCl<sub>3</sub>·2H<sub>2</sub>O.**100 gms. H<sub>2</sub>O dissolve 13.3 gms. at 18°, and 62.5 gms. at 100°.

(Godeffroy — Zeit. allgem. Oster. Apoth. No. 9, '80.)

**RUBIDIUM CHROMATE (Mono) Rb<sub>2</sub>CrO<sub>4</sub>.****SOLUBILITY IN WATER.**

(Schreinemaker and Filippo — Chem. Centralb. 77, I, 1321, '06.)

t°.	Gms. RbCrO <sub>4</sub> per 100 Gms. Solution.	t°.	Gms. RbCrO <sub>4</sub> per 100 Gms. Solution.	t°.	Gms. RbCrO <sub>4</sub> per 100 Gms. Solution.
- 7	36.65	50	47.44	- 2.40	15.58
0	38.27	60.4	48.90	- 3.25	20.03
10	40.23	Solid Phase, Ice		- 4.14	24.28
20	42.42	- 0.6	6.95	- 5.55	30.15
30	44.11	- 1.1	7.22	- 6.71	34.31
40	46.13	- 1.57	9.87	about - 7	36.65

**RUBIDIUM (Di) CHROMATE Rb<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>.**100 grams saturated aqueous solution contain 9.47 grams Rb<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> at 30°.

(Schreinemaker and Filippo.)

**RUBIDIUM HYDROXIDE RbOH.**

100 grams sat. aqueous solution contain 63.39 grams RbOH at 30°.

(Schreinemaker and Filippo.)

**RUBIDIUM IODATE RbIO<sub>3</sub>.**100 grams H<sub>2</sub>O dissolve 2.1 grams RbIO<sub>3</sub> at 23°.

(Wheeler — Am. J. Sci. [3] 44, 123, '92.)

**RUBIDIUM IODIDE RbI.**100 grams H<sub>2</sub>O dissolve 137.5 grams RbI at 6.9°, and 152.0 grams at 17.4°.

(Reissig — Liebig's Ann. 127, 33, '63.)

**SOLUBILITY OF RUBIDIUM IODIDE IN ORGANIC SOLVENTS.**  
(Walden — Z. physik. Ch. 55, 713, 718, '06.)

Solvent.	Formula.	Grams RbI per 100 cc. Solution.	
		at 0°	at 25°
Acetonitril	CH <sub>3</sub> CN	1.478	1.350
Propionitril	C <sub>2</sub> H <sub>5</sub> CN	0.274	0.305
Nitromethane	CH <sub>3</sub> NO <sub>2</sub>	0.567	0.518
Acetone	(CH <sub>3</sub> ) <sub>2</sub> CO	0.960	0.674
Furfural	C <sub>4</sub> H <sub>3</sub> O.CO.H	...	4.930

**RUBIDIUM BROM IODIDE** RbBr<sub>2</sub>I.

100 gms. sat. aq. solution contain about 44.0 gms. RbBr<sub>2</sub>I, and the Sp. Gr. of the solution is 3.84.

(Wells and Wheeler — Am. J. Sci. [3] 43, 475, '92.)

**RUBIDIUM NITRATE** RbNO<sub>3</sub>. SOLUBILITY IN WATER.

(Berkeley — Trans. Roy. Soc. (Lond.) 203 A, 207, '04.)

t°.	Mols. RbNO <sub>3</sub> Per Liter.	Grams RbNO <sub>3</sub> per 100 Gms.		t°.	Mols. RbNO <sub>3</sub> Per Liter.	Gms. RbNO <sub>3</sub> per 100 Gms.	
		Water.	Solution.			Water.	Solution.
0	1.27	19.5	16.3	60	7.99	200	66.7
10	2.04	33.0	24.8	70	9.02	251	71.5
20	3.10	53.3	34.6	80	9.93	309	75.6
30	4.34	81.3	44.8	90	10.77	375	78.9
40	5.68	116.7	53.9	100	11.54	452	81.9
50	6.88	155.6	60.9	118.3	12.76	617	86.1

**RUBIDIUM PERMANGANATE** RbMnO<sub>4</sub>.

One liter of aqueous solution contains 6.03 grams RbMnO<sub>4</sub> at 7°.

(Muthmann and Kuntze — Z. Kryst. Min. 23, 377, '94.)

100 cc. sat. aq. solution contain 0.46 gm. RbMnO<sub>4</sub> at 2°, 1.06 gms. at 19° and 4.68 gms. at 60°.

(Patterson — J. Am. Ch. Soc. 28, 1735, '06.)

**RUBIDIUM SELENATE** Rb<sub>2</sub>SeO<sub>4</sub>.

100 grams H<sub>2</sub>O dissolve 158.9 grams Rb<sub>2</sub>SeO<sub>4</sub> at 12°.

(Tutton — J. Ch. Soc. 71, 850, '97.)

**RUBIDIUM FLUO SILICATE** Rb<sub>2</sub>SiF<sub>6</sub>.

100 gms. H<sub>2</sub>O dissolve 0.16 gm. Rb<sub>2</sub>SiF<sub>6</sub> at 0°, and 1.36 gms. at 100°.

(Stolba — J. pr. Ch. 101, 1, '67.)

**RUBIDIUM SILICO TUNGSTATE** Rb<sub>8</sub>SiW<sub>12</sub>O<sub>42</sub>.

100 gms. H<sub>2</sub>O dissolve 0.65 gm. Rb<sub>8</sub>SiW<sub>12</sub>O<sub>42</sub> at 20°, and 5.1 gms. at 100°.

(Godeffroy — Ber. 9, 1363, '76.)

**RUBIDIUM SULPHATE** Rb<sub>2</sub>SO<sub>4</sub>. SOLUBILITY IN WATER.

(Etard — Ann. chim. phys. [7] 2, 550, '94; Berkeley — Trans. Roy. Soc. (Lond.) 203 A, 207, '04.)

t°.	Mols. Rb <sub>2</sub> SO <sub>4</sub> per Liter.	Gms. Rb <sub>2</sub> SO <sub>4</sub> per 100 Gms.		t°.	Mols. Rb <sub>2</sub> SO <sub>4</sub> per Liter.	Gms. Rb <sub>2</sub> SO <sub>4</sub> per 100 Gms.	
		Water.	Solution.			Water.	Solution.
0	1.27	36.4	27.3	60	2.15	67.4	40.3
10	1.46	42.6	29.9	70	2.25	71.4	41.7
20	1.64	48.2	32.5	80	2.34	75.0	42.9
30	1.79	53.5	34.9	90	2.42	78.7	44.0
40	1.92	58.5	36.9	100	2.49	81.8	45.0
50	2.04	63.1	38.7	102.4	2.50	82.6	45.2

# RUBIDIUM SULPHATE

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## SOLUBILITY OF RUBIDIUM DOUBLE SULPHATES IN WATER AT 25°.

(Locke — Am. Ch. J. 27, 459, '01.)

Formula.	Per 100 cc. H <sub>2</sub> O.		Formula.	Per 100 cc. H <sub>2</sub> O.	
	Gms. Anh. Salt.	Mols. Salt.		Gms. Anh. Salt.	Mols. Salt.
Rb <sub>2</sub> Cd(SO <sub>4</sub> ) <sub>2</sub> .6H <sub>2</sub> O	76.7	0.1615	Rb <sub>2</sub> Mn(SO <sub>4</sub> ) <sub>2</sub> .6H <sub>2</sub> O	35.7	0.0857
Rb <sub>2</sub> Co(SO <sub>4</sub> ) <sub>2</sub> .6H <sub>2</sub> O	9.28	0.022	Rb <sub>2</sub> Mg(SO <sub>4</sub> ) <sub>2</sub> .6H <sub>2</sub> O	20.2	0.0521
Rb <sub>2</sub> Cu(SO <sub>4</sub> ) <sub>2</sub> .6H <sub>2</sub> O	10.28	0.0241	Rb <sub>2</sub> Ni(SO <sub>4</sub> ) <sub>2</sub> .6H <sub>2</sub> O	5.98	0.0142
Rb <sub>2</sub> Fe(SO <sub>4</sub> ) <sub>2</sub> .6H <sub>2</sub> O	24.28	0.0579	Rb <sub>2</sub> Zn(SO <sub>4</sub> ) <sub>2</sub> .6H <sub>2</sub> O	10.10	0.0236

## SALICYLIC ACID C<sub>6</sub>H<sub>4</sub>.OH.CO<sub>2</sub>H 1:2.

### SOLUBILITY IN WATER. (See also p. 61.)

(Average curve from the closely agreeing determinations of Walker and Wood — J. Ch. Soc. 73, 620, '98; at 26.4°, Philip — *Ibid.* 87, 902, '05; at 25°, Paul — Z. physik. Ch. 14, 111, '94; at 20°, Hoitsema — *Ibid.* 27, 315, '98; Hoffmann and Langbeck — *Ibid.* 51, 400, '05. For determinations not in good agreement with the following, see Alexejew — Ann. Physik. Chem. 28, 305, '86; Bourguion — Ann. chim. phys. [5] 15, 165, '78; Ost. — J. pr. Ch. [2] 17, 232, '78.)

t°.	Gms. C <sub>6</sub> H <sub>4</sub> OHCOOH per Liter Solution.	t°.	Gms. C <sub>6</sub> H <sub>4</sub> OH.CO <sub>2</sub> H per Liter Solution.	t°.	Gms. C <sub>6</sub> H <sub>4</sub> OH.CO <sub>2</sub> H per Liter Solution.
0	0.8	25	2.2	60	8.2
10	1.2	30	2.7	70	13.2
20	1.8	40	3.7	80	20.5
		50	5.4		

## SOLUBILITY OF SALICYLIC ACID (LIQUID) IN WATER.

(Alexejew.)

Determinations by Synthetic Method. See Note, page 9. Figures read from curve.

t°.	Gms. C <sub>6</sub> H <sub>4</sub> OHCOOH per 100 Gms.	
	Aqueous Layer.	Salicylic Acid Layer.
60	7	68
70	8	64
80	12	58
90	19	49
95 (crit. temp.)		32

## SOLUBILITY OF SALICYLIC ACID IN AQUEOUS SALT SOLUTIONS AT 25° AND AT 35°.

(Hoffmann and Langbeck — Z. physik. Ch. 51, 407, '05.)

Salt.	Normality of Salt Solution.	Gms. Salt per Liter.	C <sub>6</sub> H <sub>4</sub> OHCOOH dissolved at 25°.		C <sub>6</sub> H <sub>4</sub> OH.CO <sub>2</sub> H dissolved at 35°.	
			Gms. per 1000 gms. Sat. Sol.	G. Molecular percentage.	Gms. per 1000 gms. Sat. Sol.	G. Molecular percentage.
	0.0	0.0	2.206	2.8851	3.197	
KCl	0.020	1.49	2.24	2.9216	3.23	4.2206 · 10 <sup>-4</sup>
"	0.100	7.46	2.25	2.9377	"	4.2203 "
"	0.492	36.73	2.02	2.6321	"	3.9268 "
"	1.004	74.92	1.89	2.4759	"	3.5003 "
KNO <sub>3</sub>	0.020	2.02	2.25	3.9351	"	4.2499 "
"	0.100	10.12	2.30	3.0103	"	4.3334 "
"	0.504	51.10	2.38	3.1061	"	4.4123 "
"	1.004	101.60	2.39	3.1249	"	4.3848 "
NaCl	0.020	1.19	2.23	2.9110	"	4.2062 "
"	0.100	5.95	2.22	2.9027	"	4.1806 "
"	0.497	29.50	2.00	2.6128	"	3.7171 "
"	0.988	58.80	1.72	2.2487	"	3.1596 "

**SOLUBILITY OF SALICYLIC ACID IN AQUEOUS SOLUTIONS OF SODIUM FORMATE, ACETATE, AND BUTYRATE AT 26.4°.**

(Philip — J. Ch. Soc. 87, 992, '05.)

$\frac{\text{Mols.}}{100}$ per Liter.	Na Salt	$\frac{\text{Mols.}}{100}$ $\text{C}_6\text{H}_4\text{OHCOOH}$ per Liter in:			$\frac{\text{Gms. Na Salt}}{\text{per Liter.}}$	Gms. $\text{C}_6\text{H}_4\text{OHCOOH}$ per Liter in:		
		HCOONa.	$\text{CH}_3\text{COONa.}$	$\text{C}_3\text{H}_7\text{COONa.}$		HCOONa.	$\text{CH}_3\text{COONa.}$	$\text{C}_3\text{H}_7\text{COONa.}$
0		1.71	1.71	1.71	0	2.36	2.36	2.36
1		2.35	2.47	2.50	1	3.7	3.6	3.3
2		3.05	3.35	3.48	2	5.0	5.2	4.5
3		3.7	4.2	4.35	3	6.2	6.75	5.65
4		4.3	5.1	5.3	4	7.2	8.3	6.85
5		4.8	6.1	6.3	5	...	...	8.1

**SOLUBILITY OF SALICYLIC ACID IN AQUEOUS SOLUTIONS OF SODIUM SALICYLATE AT 20.1°.**

(Hoitsema — Z. physik. Ch. 27, 315, '98.)

Gram Mols. per Liter.		Sp. Gr. of Solutions.	Grams per Liter.		Solid Phase.
$\text{C}_6\text{H}_4\text{OH}$ COOH.	$\text{C}_6\text{H}_4\text{OH}$ COONa.		$\text{C}_6\text{H}_4\text{OH}$ COOH.	$\text{C}_6\text{H}_4\text{OH}$ COONa.	
0.0132	0.0	1.002	1.823	0.0	$\text{C}_6\text{H}_4\text{OHCOOH}$
0.0112	0.017	1.003	1.55	2.705	"
0.0124	0.113	1.009	1.71	17.98	"
0.0143	0.226	1.016	1.97	35.96	"
0.0164	0.344	1.024	2.26	54.74	"
0.0203	0.500	1.034	2.80	79.56	"
0.062	1.70	1.098	8.56	270.5	"
0.095	2.11	1.137	13.11	335.7	$\text{C}_6\text{H}_4\text{OHCOOH.C}_6\text{H}_4\text{OHCOONa}$ + $\text{C}_6\text{H}_4\text{OHCOOH}$
0.091	2.19	1.144	12.56	348.4	$\text{C}_6\text{H}_4\text{OHCOOH.C}_6\text{H}_4\text{OHCOONa}$
0.086	3.41	1.215	11.88	542.6	"
0.081	4.23	1.263	11.19	673.0	$\text{C}_6\text{H}_4\text{OHCOOH.C}_6\text{H}_4\text{OHCOONa}$ + $\text{C}_6\text{H}_4\text{OHCOONa}$
0.048	4.18	1.259	6.63	665.1	$\text{C}_6\text{H}_4\text{OHCOONa}$
0.021	4.12	1.258	2.90	665.5	"
0.00	4.15	1.257	0.0	660.3	"

**SOLUBILITY OF SALICYLIC ACID IN ALCOHOLS IN ETHER AND IN ACETONE.**

(Timofeev — Compt. rend. 112, 1137, '01; at 15°, Bourgois — Ann. chim. phys. [5] 13, 405, '78; at 17° and 23°, Walker and Wood — J. Ch. Soc. 73, 620, '98.)

Solvent.	t°.	Gms. $\text{C}_6\text{H}_4\text{OHCOOH}$ per 100 Gms.		Solvent.	t°.	Gms. $\text{C}_6\text{H}_4\text{OHCOOH}$ per 100 Gms.	
		Solvent.	Solution.			Solvent.	Solution.
$\text{CH}_3\text{OH}$	-3	40.67	28.91	$\text{C}_2\text{H}_5\text{OH}(n)$	-3	26.12	20.71
$\text{CH}_3\text{OH}$	+21	62.48	38.46	$\text{C}_2\text{H}_5\text{OH}(n)$	+21	37.69	27.36
$\text{C}_2\text{H}_5\text{OH}$	-3	36.12	26.29	$(\text{CH}_3)_2\text{O}$	15	50.47	33.55
$\text{C}_2\text{H}_5\text{OH}$	+15	49.63	33.17	$(\text{CH}_3)_2\text{O}$	17		23.4*
$\text{C}_2\text{H}_5\text{OH}$	21	53.53	34.87	$(\text{CH}_3)_2\text{CO}$	23		31.3*
$\text{C}_2\text{H}_5\text{OH}$ 90%	15	42.09	29.62				

\* Per 100 cc. Sat. Solution.

# SALICYLIC ACID

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SOLUBILITY OF SALICYLIC ACID IN AQUEOUS SOLUTIONS OF ETHYL ALCOHOL, ISO BUTYL ALCOHOL, DEXTROSE, CANE SUGAR, AND OF LEVULOSE AT 25° AND AT 35°.

(Hoffmann and Langbeck — Z. physik. Ch. 51, 400, '05.)

Aq. Solvent.	Conc. of Solvent.		C <sub>6</sub> H <sub>4</sub> OHCOOH dissolved at 25°.		C <sub>6</sub> H <sub>4</sub> OHCOOH dissolved at 35°.	
	Normality.	Gms. per Liter.	Grams molecular percentage.	Grams per 100 gms. sat. solution.	Grams molecular percentage.	Grams per 100 gms. sat. solution.
H <sub>2</sub> O	0.0	0.0	2.8851	0.2206	4.1844	0.3197
C <sub>2</sub> H <sub>5</sub> OH	0.0249	1.146	2.8966.10 <sup>-4</sup>	0.222	4.2044.10 <sup>-4</sup>	0.322
"	0.0560	2.578	2.9150	"	4.2348	0.324
"	0.1747	8.04	2.9901	"	...	...
"	0.2399	11.05	...	...	4.4341	0.339
"	1.03	47.4	3.5279	"	5.2816	0.404
"	1.638	75.44	3.9253	"	...	...
C <sub>4</sub> H <sub>9</sub> OH (iso)	0.020	1.496	2.909	"	4.229	0.324
"	0.051	3.74	2.955	"	4.289	0.329
"	0.100	7.48	3.033	"	4.435	0.339
"	0.521	38.60	3.718	"	5.624	0.431
C <sub>6</sub> H <sub>12</sub> O <sub>6</sub>	0.02	3.6	2.886	"	4.184	0.321
"	0.10	18.0	2.898	"	4.202	0.322
"	0.50	89.6	2.954	"	4.263	0.326
"	1.00	180.0	3.015	"	4.360	0.334
C <sub>12</sub> H <sub>22</sub> O <sub>11</sub>	0.02	6.88	2.885	"	4.206	0.322
"	0.10	34.97	2.964	"	4.287	0.328
"	0.50	172.0	3.239	"	4.697	0.360
"	1.10	376.3	3.633	"	5.236	0.401
C <sub>6</sub> H <sub>12</sub> O <sub>6</sub>	0.02	3.6	2.888	"	0.221	...
"	0.06	10.8	2.895	"	0.221	...
"	0.25	45.0	2.944	"	0.225	...

# SOLUBILITY OF SALICYLIC ACID IN BENZENE.

(Walker and Wood — J. Ch. Soc. 73, 620, '98.)

t°.	Gms. C <sub>6</sub> H <sub>4</sub> OHCOOH per 100 Gms. C <sub>6</sub> H <sub>6</sub> .	t°.	Gms. C <sub>6</sub> H <sub>4</sub> OHCOOH per 100 Gms. C <sub>6</sub> H <sub>6</sub> .	t°.	Gms. C <sub>6</sub> H <sub>4</sub> OHCOOH per 100 Gms. C <sub>6</sub> H <sub>6</sub> .
11.7	0.460	30.5	0.991	49.4	2.380
18.2	0.579	34.6	1.261	64.2	4.40
		36.6	1.430		

# SELENIUM Se.

## SOLUBILITY IN CARBON BISULPHIDE.

(Marc — Z. anorg. Ch. 48, 425, '06.)

100 cc. CS<sub>2</sub> dissolve 0.065 gm. amorphous Se at room temperature. Se which is heated to 180° for 6-7 hours is insoluble in CS<sub>2</sub>. Se crystallized from the melt at 200° is insoluble in CS<sub>2</sub>. Se heated once quickly to 140° is very slightly soluble in CS<sub>2</sub>.

100 gms. methylene iodide (CH<sub>2</sub>I<sub>2</sub>) dissolve 1.3 gms. Se at 12°.

(Retgers — Z. anorg. Ch. 3, 346, '93.)

**SELENIOUS ACID**  $\text{H}_2\text{SeO}_3$ .

## SOLUBILITY IN WATER.

(Etard — Ann. chim. phys. [7] 2, 551, '94.)

t°.	Gms. $\text{H}_2\text{SeO}_3$ per 100 Gms. Solution.	t°.	Gms. $\text{H}_2\text{SeO}_3$ per 100 Gms. Solution.	t°.	Gms. $\text{H}_2\text{SeO}_3$ per 100 Gms. Solution.
-10	42.2	25	67.0	60	79.3
0	47.4	30	70.2	70	79.3
+10	55.0	40	77.5	80	79.3
20	62.5	50	79.2	90	79.4

**SILICON** Si.

## SOLUBILITY IN LEAD AND IN ZINC.

(Moissan and Siemens — Ber. 37, 2088, '04.)

In Lead.		In Zinc.	
t°.	Gms. Si per 100 Gms. Solution.	t°.	Gms. Si per 100 Gms. Solution.
1250	0.024	600	0.06
1330	0.070	650	0.15
1400	0.150	730	0.57
1450	0.210	800	0.92
1550	0.780	850	1.62

**SILICON IODIDES**  $\text{Si}_2\text{I}_6$ ,  $\text{SiI}_4$ .

## SOLUBILITY IN CARBON BISULPHIDE.

(Friedel and Lachburg — Bull. soc. chim. [2] 12, 92, '69; Friedel — Liebig's Ann. 149, 96, '69.)

100 gms.  $\text{CS}_2$  dissolve 19 gms.  $\text{Si}_2\text{I}_6$  at 19°.  
 100 gms.  $\text{CS}_2$  dissolve 26 gms.  $\text{Si}_2\text{I}_6$  at 27°.  
 100 gms.  $\text{CS}_2$  dissolve 2.2 gms.  $\text{SiI}_4$  at 27°.

**SILICO TUNGSTIC ACID**  $\text{H}_2\text{SiW}_{12}\text{O}_{42}$ .

100 gms.  $\text{H}_2\text{O}$  dissolve 961.5 crystallized silico tungstic acid at 18°,  
 and solution has Sp. Gr. 2.843.



For equilibrium between metallic *Silver* and mercury (*Silver amalgam*) and mixed aqueous solutions of their nitrates, determined for mixtures of the two metals in all proportions, see Reinders — *Z. physik. Ch.* 54, 609, '06.

**SILVER ACETATE**  $\text{CH}_3\text{COOAg}$ .

## SOLUBILITY IN WATER.

(Nernst — *Z. physik. Ch.* 4, 379, '89; Arrhenius — *Ibid.* 11, 396, '03; Goldschmidt — *Ibid.* 25, 93, '08; Nauman and Rucker — *Ber.* 38, 2293, '05; Raupenstrauch — *Monatsh. Ch.* 6, 585, '85; Wright and Thompson — *Phil. Mag.* [5] 17, 288, '84; 19, 1, '85.)

t°.	Gms. Ag(C <sub>2</sub> H <sub>3</sub> O <sub>2</sub> ) per Liter.	t°.	Gms. Ag(C <sub>2</sub> H <sub>3</sub> O <sub>2</sub> ) per Liter.	t°.	Gms. Ag(C <sub>2</sub> H <sub>3</sub> O <sub>2</sub> ) per Liter.
0	7.22	25	11.2	50	16.4
10	8.75	30	12.1	60	18.9
15	9.4	40	14.1	70	21.8
20	10.4			80	25.2

## SOLUBILITY OF SILVER ACETATE IN AQUEOUS SOLUTIONS OF:

Silver Nitrate.			Sodium Acetate.		
Gms. AgNO <sub>3</sub> per Liter.	Gms. CH <sub>3</sub> COOAg per Liter at:		Gms. CH <sub>3</sub> COONa per Liter.	Gms. CH <sub>3</sub> COOHg per Liter at:	
	16° (Nernst).	19.8° (Arrhenius).		16° (N. N. and R.).	18.6° (A.).
0	10.05	9.85	0	10.05	9.9
5	8.2	7.9	5	6.3	6.6
10	7.0	6.6	10	4.6	4.9
15	6.4	5.5	15	3.8	4.1
20	5.7	4.5	20	3.3	3.5
30	4.4	...	30	...	2.8
40	3.2	...	40	...	2.4

**SILVER Mono Chlor ACETATE**  $\text{CH}_2\text{ClCOOAg}$ .

One liter aqueous solution contains 12.97 grams  $\text{CH}_2\text{ClCOOAg}$  at 16.9°. (Arrhenius)

## SOLUBILITY OF SILVER MONO CHLOR ACETATE AT 16.9° IN AQUEOUS SOLUTIONS OF:

Silver Nitrate.		Sodium Chlor Acetate.	
Gms. AgNO <sub>3</sub> per Liter.	Gms. CH <sub>2</sub> ClCOOAg per Liter.	Gms. CH <sub>2</sub> ClCOONa per Liter.	Gms. CH <sub>2</sub> ClCOOAg per Liter.
0.0	12.97	0.0	12.97
9.6	10.05	3.88	10.05
17.0	7.55	7.77	8.16
		15.53	6.02
		31.07	4.19
		58.26	3.26

**SILVER Di Propyl ACETATE**  $\text{AgC}_5\text{H}_{11}\text{O}_2$ .

100 gms.  $\text{H}_2\text{O}$  dissolve 0.123 gm.  $\text{AgC}_5\text{H}_{11}\text{O}_2$  at 11.7°, and 0.190 gm. at 72°.

(Fürth — *Monatsh. Ch.* 9, 311, '88.)

**SILVER Methyl Ethyl ACETATE**  $\text{Ag} \cdot \text{CH}_3 \cdot \text{CH}_2 \cdot \text{CH}(\text{CH}_3) \cdot \text{COO}$ .

**SILVER Di Ethyl ACETATE**  $\text{Ag} \cdot [(\text{C}_2\text{H}_5)_2\text{CH} \cdot \text{COO}]$ .

**SILVER Tri Methyl ACETATE**  $\text{Ag} \cdot (\text{CH}_3)_3\text{CCOO} \cdot$ \*

#### SOLUBILITY OF EACH WATER.

(Sedlitzky — *Monatsh. Ch.* 8, 563, '87; Keppish — *Ibid.* 9, 589, '88; Stiasny — *Ibid.* 12, 601, '91.)

t°.	Gms. per 100 Gms. H <sub>2</sub> O.			t°.	Gms. per 100 Gms. H <sub>2</sub> O.		
	$\text{Ag} \cdot \text{C}_2\text{H}_3\text{O}_2$ .	$\text{Ag} \cdot \text{C}_2\text{H}_5\text{O}_2$ .	$\text{Ag} \cdot \text{C}_2\text{H}_5\text{O}_2 \cdot$ *		$\text{Ag} \cdot \text{C}_2\text{H}_3\text{O}_2$ .	$\text{Ag} \cdot \text{C}_2\text{H}_5\text{O}_2$ .	$\text{Ag} \cdot \text{C}_2\text{H}_5\text{O}_2 \cdot$ *
0	1.112	0.402	1.10	50	1.602	0.536	1.47
10	1.126	0.413	1.15	60	1.827	0.585	1.57
20	1.182	0.432	1.22	70	2.093	0.643	1.68
30	1.280	0.458	1.22	80	2.402	...	1.80
40	1.420	0.494	1.37				

**SILVER BENZOATE**  $\text{C}_6\text{H}_5\text{COOAg}$ .

One liter of aqueous solution contains 1.763 gms.  $\text{C}_6\text{H}_5\text{COOAg}$  at 14.5°, and 2.607 gms. at 25°.

(Holleman — *Z. physik. Ch.* 12, 129, '93; Noyes and Schwartz — *Ibid.* 27, 287, '98.)

#### SOLUBILITY OF SILVER BENZOATE AT 25° IN AQUEOUS SOLUTIONS OF:

Nitric Acid (N. and S.).				Chlor Acetic Acid (N. and S.).			
Millimols per Liter.		Grams per Liter.		Millimols per Liter.		Grams per Liter.	
$\text{HNO}_3$ .	$\text{C}_6\text{H}_5\text{COOAg}$ .	$\text{HNO}_3$ .	$\text{C}_6\text{H}_5\text{COOAg}$ .	$\text{CH}_3\text{ClCOOH}$ .	$\text{C}_6\text{H}_5\text{COOAg}$ .	$\text{CH}_3\text{ClCOOH}$ .	$\text{C}_6\text{H}_5\text{COOAg}$ .
0.0	0.01144	0.0	2.607	0.0	0.01144	0.0	2.607
0.004435	0.01395	0.280	3.195	0.00394	0.01385	0.371	3.172
0.00887	0.01698	0.559	3.889	0.00787	0.01612	0.744	3.691
0.00892	0.01715	0.562	3.926	0.01574	0.02093	1.487	4.792
0.01774	0.02324	1.118	5.321				
0.02674	0.03071	1.686	7.031				

One liter of cold alcohol dissolves 0.169 gm.  $\text{C}_6\text{H}_5\text{COOAg}$ ; one liter of boiling alcohol dissolves 0.465 gram.

(Liebermann — *Ber.* 35, 1094, '02.)

**SILVER BORATE**  $\text{AgBO}_2$ .

One liter of aqueous solution contains about 9.05 gms.  $\text{AgBO}_2$  at 25°.

(Abegg and Cox — *Z. physik. Ch.* 46, 11, '03.)

**SILVER BROMATE**  $\text{AgBrO}_3$ .

#### SOLUBILITY IN WATER.

t°.	Gms. $\text{AgBrO}_3$ per Liter.	Authority.
20	1.586	(Böttger — <i>Z. physik. Ch.</i> 46, 602, '03.)
24.5	1.911	(Noyes — <i>Z. physik. Ch.</i> 6, 246, '90.)
25	1.68	(Longi — <i>Gazz. chim. ital.</i> 13, , '83.)

#### SOLUBILITY OF SILVER BROMATE IN AQUEOUS AMMONIA AND NITRIC ACID SOLUTIONS AT 25°.

(Longi.)

Solvent.	Sp. Gr.	Grams $\text{AgBrO}_3$ per	
		1000 cc. Sol.	1000 Gms. Sol.
Ammonia	0.998 = 5%	35.10	35.54
Ammonia	0.96 = 10%	443.6	462.5
Nitric Acid	1.21 = 35%	3.81	3.12

# SILVER BROMATE

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## SOLUBILITY OF SILVER BROMATE AT 24.5° IN AQUEOUS SOLUTIONS OF:

Silver Nitrate (Noyes).				Potassium Bromate (N.).			
Normal Content.		Gms. per Liter.		Normal Content.		Gms. per Liter.	
AgNO <sub>3</sub> .	AgBrO <sub>3</sub> .	AgNO <sub>3</sub> .	AgBrO <sub>3</sub> .	KBrO <sub>3</sub> .	AgBrO <sub>3</sub> .	KBrO <sub>3</sub> .	AgBrO <sub>3</sub> .
0.0	0.0081	0.0	1.911	0.0	0.0081	0.0	1.911
0.0085	0.0051	1.445	1.203	0.0085	0.00519	1.42	1.225
0.0346	0.0022	5.882	0.510	0.0346	0.00227	5.78	0.536

# SILVER BROMIDE AgBr.

## SOLUBILITY IN WATER.

t°.	Gms. AgBr per Liter.	Authority.
20	0.000084	(Böttger — Z. physik. Ch. 46, 602, '03.)
25	0.000137	(Abegg and Cox — Z. physik. Ch. 46, 11, '03.)
100	0.00370	(Böttger — Z. physik. Ch. 56, 93, '06.)

(See also Holleman — Z. physik. Ch. 12, 129, '93; Kohlrausch — *Ibid.* 50, 365, '05.)

## SOLUBILITY OF SILVER BROMIDE IN AQUEOUS AMMONIA SOLUTIONS.

(Longi — Gazz. chim. ital. 13, 87, '83; at 80°, Pohl — Sitzber. Akad. Wiss. Wien, 41, 267, '60.)

Solvent.		Gms. AgBr at 12° per		Gms. AgBr at 80° per
		1000 cc. Solvent.	1000 Gms. Solvent.	
Ammonia Sp. Gr. 0.998 = 5%		0.114	0.114	...
Ammonia Sp. Gr. 0.96 = 10%		3.33-4.0	3.47	...
Ammonia Sp. Gr. 0.986		...	...	0.51* 1.0†

\* Dried AgBr. † Freshly pptd.

## SOLUBILITY OF SILVER BROMIDE IN AQUEOUS SOLUTIONS OF: Ammonia at 0°. Mono Methyl Amine at 11.5°.

(Jarry — Ann. chim. phys. [7] 17, 363, '99.)

(Jarry.)

Grams per 100 cc. Solution.				Gms. per 100 cc. Solution.	
NH <sub>3</sub> Gas.	AgBr.	NH <sub>3</sub> Gas.	AgBr.	NH <sub>2</sub> CH <sub>3</sub> .	AgBr.
3.07	0.080	26.27	1.067	11.01	0.07
4.88	0.096	31.26	1.568	13.17	0.12
6.69	0.172	33.89	1.987	15.13	0.16
8.29	0.212	36.52	2.669	17.97	0.28
11.51	0.349	37.22	2.888	32.58	0.55
15.32	0.557	37.70	2.930	35.62	0.73
18.09	0.722	39.26	2.892	43.11	1.27
19.53	0.741	39.95	2.852	48.44	2.89

## SOLUBILITY OF SILVER BROMIDE IN AQUEOUS SOLUTIONS OF SODIUM THIO SULPHATE AT 35°.

(Richards and Faber — Am. Ch. J. 21, 186, '99.)

Gms. Cryst. Na Thio Sulphate per Liter.	Gms. AgBr Dissolved per Gram of Thio Sulphate.	Mols. AgBr Dissolved per Mol. of Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> .
100	0.376	0.496
200	0.390	0.515
300	0.397	0.524
400	0.427	0.564

## SOLUBILITY OF SILVER BROMIDE IN AQUEOUS SALT SOLUTIONS.

(Valenta — Monatsch. Ch. 15, 250, '94; see also Cohn — Z. physik. Ch. 18, 61, '95.)

Salt Solution.	t°.	Gms. AgBr per 100 Gms. Aq. Solution of Concentration:				
		1:100.	5:100.	10:100.	15:100.	20:100.
Sodium Thio Sulphate	20	0.35	1.90	3.50	4.20	5.80
“ “ Calc. by Cohn	20	0.50	2.40	4.59	6.58	8.40
Sodium Sulphite	25	...	...	0.04	...	0.08
Potassium Cyanide	25	...	6.55	...	...	...
“ “ Calc. by Cohn	25	...	6.85	...	...	...
Potassium Sulphocyanide	25	...	...	0.73	...	...
Ammonium Sulphocyanide	20	...	0.21	2.04	5.30	...
Calcium Sulphocyanide	25	...	...	0.53	...	...
Barium Sulphocyanide	25	...	...	0.35	...	...
Aluminum Sulphocyanide	25	...	...	4.50	...	...
Thio Carbamide	25	...	...	1.87	...	...
Thio Cyanime	25	0.08	0.35	0.72	...	...

NOTE. — Cohn shows that the lower results obtained by Valenta are due to the excess of solid AgBr used and the consequent formation of the less soluble di salt  $3(\text{AgS}_2\text{O}_3\text{Na})_2$ , instead of the more soluble salt  $(\text{AgS}_2\text{O}_3\text{Na})_2\text{Na}_2\text{S}_2\text{O}_8$ .

100 cc.  $\text{H}_2\text{O}$  containing 10 per cent of normal mercuric acetate,  $\text{Hg}(\text{C}_2\text{H}_3\text{O}_2)_2$ , + Aq., dissolve 0.0122 gram AgBr at 20°.

100 gms. NaCl in conc. aq. solution dissolve 0.474 gm. AgBr at 15°.

100 gms. NaCl in 21 per cent solution dissolve 0.182 gm. AgBr at 15°.

100 gms. KBr in conc. solution dissolve 3.019 gms. AgBr at 15°.

95 gms. NaCl + 10 gms. KBr in conc. aq. solution dissolve 0.075 gm. AgBr at 15°.

(Schierholz — Sitzber. K. Akad. Wiss. (Vienna) 101, 2b, 4, '90.)

SILVER BUTYRATE  $\text{C}_4\text{H}_7\text{COOAg}$ .SILVER (Iso) BUTYRATE  $(\text{CH}_3)_2\text{CHCOOAg}$ .

## SOLUBILITY OF EACH IN WATER.

(Goldschmidt — Z. physik. Ch. 25, 93, '98; Arrhenius — *Ibid.* 11, 306, '93; Raupenstrauch — Monatsch. Ch. 6, 589, '85.)

t°.	Gms. per 100 Grams $\text{H}_2\text{O}$ .		t°.	Grams per 100 Gms. $\text{H}_2\text{O}$ .	
	Butyrate.	Iso Butyrate.		Butyrate.	Iso Butyrate.
0	0.363	0.796	30	0.561 (1.102 G.)	1.060
10	0.419	0.874	40	0.647	...
17.8	0.432 (A.)	...	50	0.742	1.313
18.8	0.445 (A.)	...	60	0.848	...
20	0.484 (0.999 G.)	0.961	70	0.901	1.670
25	... (1.044 G.)	...	80	1.14	1.898

# SILVER BUTYRATE

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## SOLUBILITY OF SILVER BUTYRATE IN Aq. SOLUTIONS OF SILVER ACETATE, SILVER NITRATE AND OF SODIUM BUTYRATE.

(Arrhenius — Z. physik. Ch. 11, 396, '93.)

### In Silver Acetate at 17.8°.

G. Mols. per Liter.		Grams per Liter.	
$\text{CH}_3\text{COONa}$	$\text{C}_4\text{H}_7\text{COONa}$	$\text{CH}_3\text{COOAg}$	$\text{C}_4\text{H}_7\text{COOAg}$
0.0	0.0221	0.0	4.32
0.0270	0.0139	4.51	2.71
0.0506	0.0103	8.45	2.01

### In Silver Nitrate at 18.8°.

G. Mols. per Liter.		Grams per Liter.	
$\text{AgNO}_3$	$\text{C}_4\text{H}_7\text{COOAg}$	$\text{AgNO}_3$	$\text{C}_4\text{H}_7\text{COOAg}$
0.0	0.0228	0.0	4.445
0.0667	0.0078	11.33	1.521
0.100	0.0062	17.00	1.209

### In Sodium Butyrate at 18.2°.

G. Mols. per Liter.		Grams per Liter.		G. Mols. per Liter.		Grams per Liter.	
$\text{C}_4\text{H}_7\text{COONa}$	$\text{C}_4\text{H}_7\text{COOAg}$	$\text{C}_4\text{H}_7\text{COONa}$	$\text{C}_4\text{H}_7\text{COOAg}$	$\text{C}_4\text{H}_7\text{COONa}$	$\text{C}_4\text{H}_7\text{COOAg}$	$\text{C}_4\text{H}_7\text{COONa}$	$\text{C}_4\text{H}_7\text{COOAg}$
0.0	0.0224	0.0	4.363	0.0658	0.0091	7.24	1.774
0.0066	0.0199	0.73	3.881	0.1315	0.0060	14.47	1.170
0.0164	0.0169	1.81	3.296	0.263	0.0040	28.96	0.780
0.0329	0.0131	3.62	2.555	0.493	0.0027	54.28	0.526

# SILVER CAPROATES $\text{Ag}(\text{C}_6\text{H}_{11}\text{O}_2)$ .

## SOLUBILITY IN WATER.

(Keppish — Monatsh. Ch. 9, 589, '88; Stiassny — *Ibid.* 12, 506, '91; Kulisch — *Ibid.* 14, 570, '93; König — *Ibid.* 15, 26, '94; Altschul — *Ibid.* 17, 568, '96.)

### Results in terms of grams salt per 100 grams $\text{H}_2\text{O}$ .

t°.	Normal Caproate $\text{CH}_3(\text{CH}_2)_4\text{COOAg}$ .		2 Methyl Pentan 4 Acid $\text{CH}_3\text{CH}(\text{CH}_3)\text{CH}_2\text{CH}_2\text{COOAg}$ .	Methyl 3 Pentan Acid 4 $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{COOAg}$ .	4 Methyl Pentan Acid $\text{CH}_3(\text{CH}_2)_2\text{CH}(\text{CH}_3)\text{COOAg}$ .
0	0.076 (A.)	0.078 (Keppisch)	0.168 (König)	0.880 (Kulish)	0.510 (Stiassny)
10	0.085	0.089	0.162	0.858	0.528
20	0.100	0.107	0.163	0.849	0.550
30	0.123	0.131	0.170	0.854	0.574
40	0.154	0.161	0.183	0.871	0.602
50	0.193	0.198	0.203	0.902	0.632
60	0.240	0.243	0.229	0.946	0.666
70	0.295	0.288	0.263	1.003	0.702
80	0.354	...	0.300	1.073	0.742
90	...	...	0.347	1.157	...

# SILVER CARBONATE $\text{Ag}_2\text{CO}_3$ .

## SOLUBILITY IN WATER.

t°.	Gms. $\text{Ag}_2\text{CO}_3$ per Liter.	Authority.
15	0.031	(Kremers — Pogg. Ann. 85, 248, '52.)
25	0.033 (0.00012 gm. atoms Ag.)	(Abegg and Cox — Z. physik. Ch. 46, 11, '03.)
100	0.50	(Joulin — Ann. chim. phys. [4] 30, 260, '73.)
15	0.85 (in $\text{H}_2\text{O}$ sat. with $\text{CO}_2$ )	(Johnson — Ch. News, 54, 75, '86.)

# SILVER CHLORATE $\text{AgClO}_3$ .

100 grams cold water dissolve 10 grams  $\text{AgClO}_3$  (Vauquelin); 20 gms.  $\text{AgClO}_3$  (Wächter).

**SILVER CHLORIDE AgCl.****SOLUBILITY IN WATER.**

(A large number of determinations are quoted by Abegg and Cox — Z. physik. Ch. 46, 11, '03; see also Kohlrausch — *Ibid.* 50, 356, '04-'05; Böttger — *Ibid.* 46, 602, '03, 56, 93, '06.)

t°.	14°.	20°.	25°.	42°.	100°.
Gms. AgCl per liter	0.0014	0.0016	0.0020	0.0040	0.0218

**SOLUBILITY OF SILVER CHLORIDE IN AQUEOUS SOLUTIONS OF:**

**Ammonia at 0°.** **Mono Methyl Amine at 11.5°.**  
(Jarry — Ann. chim. phys. [7] 17, 342, '99.) (Jarry.)

Grams per 100 Gms. Solution.				Gms. per 100 Gms. Solution.	
NH <sub>3</sub> Gas.	AgCl.	NH <sub>3</sub> Gas.	AgCl.	NH <sub>2</sub> CH <sub>3</sub> .	AgCl.
1.45	0.49	28.16	6.59	1.78	0.16
1.94	1.36	29.80	7.09	4.44	0.62
5.60	3.44	30.19	7.25	5.51	0.83
6.24	4.00	32.43	5.87	7.66	1.32
11.77	4.68	34.56	4.77	13.70	3.29
16.36	5.18	37.48	3.90	18.69	5.43
				36.69	9.93

**SOLUBILITY OF SILVER CHLORIDE IN AQUEOUS SOLUTIONS OF AMMONIA.**

(Longi — Gazz. chim. ital. 13, 87, '83; at 25°, Valenta — Monatsh. Ch. 15, 250, '94; at 80°, Pohl — Sitzber. Akad. Wiss. Wien, 41, 627, '60.)

Solvent.	t°.	Gms. AgCl per 100 Gms. Solvent.
Aq. Ammonia of 0.998 Sp. Gr. = 5%	12	0.233
" 0.96 Sp. Gr. = 10%	18	7.84
" 0.986 Sp. Gr.	80	1.49
" = 3%	25	1.40
" = 15%	25	7.58

**SOLUBILITY OF SILVER CHLORIDE IN AQUEOUS SOLUTIONS OF AMMONIUM CHLORIDE.**

(Schierholz — Sitzber. K. Akad. Wiss. (Vienna) 101, 2b, 8, '90; see also Vogel — N. Rep. Pharm. 23, 335, '74. Hahn — Wyandotte Silver Smelting Wks., 1877.)

Solubility at 15°.		Solubility at Different Temperatures.	
Grams per 100 Gms. Solution.		t°.	Gms. per 100 Gms. Solution.
NH <sub>4</sub> Cl.	AgCl.		NH <sub>4</sub> Cl. AgCl.
10.00	0.0050	15	26.31 0.276
14.29	0.0143	40	" 0.329
17.70	0.0354	60	" 0.421
19.23	0.0577	80	" 0.592
21.98	0.110	90	" 0.711
25.31	0.228	100	" 0.856
28.45	0.340 (24.5)	110	" 1.053
Sat. at ord. temp.	0.157	Sp. Gr. of 26.31 % NH <sub>4</sub> Cl solution at 15° = 1.08.	

# SILVER CHLORIDE

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## SOLUBILITY OF SILVER CHLORIDE IN AQUEOUS SOLUTIONS OF ALUMINUM AND AMMONIUM SALTS.

(Valenta; see also Cohn — Z. physik. Ch. 18, 61, '95.)

Aq. Salt Solution.	t°.	Gms. AgCl per 100 Gms. Solvent of Concentration:		
		1 : 100.	5 : 100.	20 : 100.
Aluminum Sulphocyanide	25	...	...	2.02
Ammonium Carbonate	25	...	...	0.05
“ Sulphocyanide	20	...	0.08	0.54
“ Thio Sulphate	20	0.57	1.32	3.92
“ “ Calc. by Cohn*		0.64	3.07	5.86

\* See Note, p. 281.

## SOLUBILITY OF SILVER CHLORIDE IN AQUEOUS HYDROCHLORIC ACID SOLUTIONS AT ORDINARY TEMPERATURE.

(Pierre — J. pharm. chim. [3] 12, 237, '47; Vogel.)

Solvent.	Gms. AgCl per Liter.	Solvent.	Gms. AgCl per Liter.
Conc. HCl + Aq.	5.0	100 vol. sat. HCl + 10 vol. H <sub>2</sub> O	0.56
1 vol. Conc. HCl + 1 vol. H <sub>2</sub> O	1.6	“ + 20 “ “	0.18
Sat. HCl. Sp. Gr. 1.165	2.98	“ + 30 “ “	0.09
“ “ (at b. pt.)	5.60	“ + 50 “ “	0.035

## SOLUBILITY OF SILVER CHLORIDE IN AQUEOUS SALT SOLUTIONS.

(Vogel; Hahn; Valenta)

Salt Solution.	Conc. of Salt.	t°.	Gms. AgCl per 100 Gms. Solution.
Barium Chloride	27.32%	24.5	0.057 (H.)
Barium Chloride	saturated	ord. temp.	0.014 (Vg.)
Barium Sulphocyanide	10 : 100	25	0.20 (Vl.)
Calcium Sulphocyanide	10 : 100	25	0.15 (Vl.)
Calcium Chloride	41.26%	24.5	0.571 (H.)
Calcium Chloride	saturated	ord. temp.	0.093 (Vg.)
Copper Chloride	“	24.5	0.053 (H.)
Ferrous Chloride	“	“	0.169 (H.)
Ferric Chloride	“	“	0.006 (H.)
Manganese Chloride	“	“	0.013 (H.)
Magnesium Chloride	50 : 100	25	0.50 (Vl.)
Magnesium Chloride	36.35%	24.5	0.531 (H.)
Magnesium Chloride	saturated	ord. temp.	0.171 (Vg.)
Strontium Chloride	“	“	0.088 (Vg.)
Zinc Chloride	“	24.5	0.0134 (H.)
Potassium Chloride	“	ord. temp.	0.0475 (Vg.)
Potassium Chloride	24.95%	19.6	0.0776 (H.)
Potassium Cyanide	5 : 100	25	2.75 (Vl.)
Potassium Cyanide	5 : 100	25	5.24 (Cohn*)
Potassium Sulphocyanide	10 : 100	25	0.11 (Vl.)
Sodium Chloride	saturated	ord. temp.	0.095 (Vg.)
Sodium Chloride	25.95%	19.6	0.105 (H.)

\* See Note, page 281.

### SOLUBILITY OF SILVER CHLORIDE IN AQUEOUS SOLUTIONS OF POTASSIUM CHLORIDE AT 15°.

(Schierholz — Sitzber. K. Akad. Wiss. (Vienna) 101, 2b, 8, '90.)

Grams per 100 Grams Solution.		Grams per 100 Grams Solution.	
KCl.	AgCl.	KCl.	AgCl.
10.0	0.000	22.47	0.045
14.29	0.004	24.0	0.072
16.66	0.008	25.0	0.084
20.00	0.020	Sp. Gr. of 25% KCl sol., = 1.179	

### MIXTURES OF SILVER CHLORIDE AND SILVER HYDROXIDE IN EQUILIBRIUM WITH AQ. POTASSIUM HYDROXIDE SOLUTIONS AT 25°.

(Noyes and Kohr — J. Am. Ch. Soc. 24, 1144, '02.)

Normality of KOH.	Millimols per Liter.		Grams per Liter.		
	KCl.	KOH.	KCl.	KOH.	AgCl.
0.333	3.414	347.8	0.255	10.05	0.4896
0.065	0.598	65.0	0.0446	2.00	0.0828

### SOLUBILITY OF SILVER CHLORIDE IN AQ. SOL. OF SODIUM CHLORIDE. (Schierholz; Vogel; Hahn.)

Solubility at 15°.		t°.	Solubility at Different Temperatures.	
Gms. per 100 Gms. Solution.			Gms. AgCl per 100 Gms. Solution in:	
NaCl.	AgCl.		14% NaCl	26.3% NaCl.
10.0	0.0025	15	0.007	0.128
14.29	0.0071	30	0.011	0.132
18.18	0.0182	40	0.014	0.158
21.98	0.0439	50	0.023	0.184
23.53	0.0706	70	0.042	0.263
25.64	0.103	80	0.054	0.315
26.31	0.127	90	0.069	0.368
		100	0.090	0.460
Sp. Gr. of 26.31% NaCl sol. = 1.207.		109	0.107 (104°)	0.571

### SOLUBILITY AT 20°, 50°, AND 90° (CALC. FROM ORIGINAL).

(Barlow — J. Am. Chem. Soc. 28, 1446, '06)

Gms. NaCl per 100 cc. Solution.	Gms. AgCl dissolved per 100 cc. Solution at:			Gms. NaCl per 100 cc. Solution.	Gms. AgCl dissolved per 100 cc. Solution at:		
	20°.	50°.	90°.		20°.	50°.	90°.
3.43	0.00018	0.0016	0.0067	11.5	0.0031	0.0124	0.0436
4.60	0.00025	0.0025	0.0100	15.3	0.0090	0.0191	0.0732
5.75	0.00047	0.0034	0.0135	23.0	0.0313	0.0889	0.1706
7.67	0.00125	0.0058	0.0236				

Results are also given for the solubility of silver chloride in aqueous sodium chloride solutions containing hydrochloric acid.

### SOLUBILITY OF SILVER CHLORIDE IN AQ. SODIUM NITRATE SOLUTIONS.

t°.	Gms. per 100 Gms. H <sub>2</sub> O.		t°.	Gms. per 100 Gms. H <sub>2</sub> O.	
	NaNO <sub>3</sub> .	AgCl.		NaNO <sub>3</sub> .	AgCl.
5	0.787	0.00086	15-20	0.393	0.00096
18	0.787	0.00146	"	0.787	0.00133
30	0.787	0.00233	"	2.787	0.00253
45-55	0.787	0.00399		(Mulder)	



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**SOLUBILITY OF SILVER CHLORIDE IN AQUEOUS SOLUTIONS OF SODIUM THIO SULPHATE, ETC.**

(Valenta ; Cohn ; Richards and Faber — Am. Ch. J. 21, 168, '99.)

Salt Solution.	t°.	Gms. AgCl per 100 Gms. Aq. Solutions of Concentration:				
		1 : 100.	5 : 100.	10 : 100.	15 : 100.	20 : 100.
Sodium Sulphite	25	...	...	0.44	...	0.95
Sodium Thio Sulphate	20	0.40	2.00	4.10	5.50	6.10
" " Calc. by Cohn*		0.38	1.83	3.50	5.02	6.41
Sodium Thio Sulphate	35	...	...	...	...	9.08 †
Thio Carbamide	25	...	...	0.83	...	...
Thio Cyanime	25	0.40	1.90	3.90	...	...

\* See Note, page 281.

† Gms. per 100 cc. solution (R. and F.).

**SILVER CHROMATE  $\text{Ag}_2\text{CrO}_4$ .**

One liter of water dissolves 0.026 gm.  $\text{Ag}_2\text{CrO}_4$  at 18°, and 0.020 gm. at 25°. (Abegg and Cox — Z. physik. Ch. 46, 11, '03, Kohlrausch — *Ibid* 50, 356, '04-'05)

**SOLUBILITY OF SILVER CHROMATE IN AQUEOUS SOLUTIONS OF NITRATES AT 100°.**

(Carpenter — J. Soc. Chem. Ind. 5, 286, '86.)

Solvent.	Gms. Salt per 100 cc. $\text{H}_2\text{O}$ .	Gms. $\text{Ag}_2\text{CrO}_4$ per 100 cc. Solution.
Water	0	0.064
Sodium Nitrate	50	0.064
Potassium Nitrate	50	0.192
Ammonium Nitrate	50	0.320
Magnesium Nitrate	50	0.256

**SILVER (Di) CHROMATE  $\text{Ag}_2\text{Cr}_2\text{O}_7$ .**

One liter of aqueous solution contains 0.00019 gram mols. or 0.083 gram  $\text{Ag}_2\text{Cr}_2\text{O}_7$  at 15°. (Mayer — Ber. 36, 1741, '03.)

**SILVER CITRATE  $\text{C}_6\text{H}_5\text{O}_7\text{Ag}_3$ .**

100 gms.  $\text{H}_2\text{O}$  dissolve 0.0277 gm.  $\text{C}_6\text{H}_5\text{O}_7\text{Ag}_3$  at 18°, and 0.0284 gm. at 25°. (Partheil and Hübner — Archiv. Pharm. 241, 413, '03.)

**SILVER CYANIDE  $\text{AgCN}$ .**

One liter of aqueous solution contains 0.000043 gm.  $\text{AgCN}$  at 17.5° and 0.00022 gm. at 20° (by Conductivity Method).

(Abegg and Cox — Böttger — Z. physik. Ch. 46, 602, '03.)

**SOLUBILITY OF SILVER CYANIDE IN AQUEOUS AMMONIA SOLUTIONS.**

(Longi — Gazz. chem. ital. 13, 87, '83.)

100 gms. aq. ammonia of 0.998 Sp. Gr. = 5% dissolve 0.232 gm.  $\text{AgCN}$  at 12°.

100 gms. aq. ammonia of 0.96 Sp. Gr. = 10% dissolve 0.542 gm.  $\text{AgCN}$  at 18°.

**SILVER SODIUM CYANIDE  $\text{AgCN}.\text{NaCN}$ .**

100 gms.  $\text{H}_2\text{O}$  dissolve 20 gms. at 20°, and more at a higher temperature. 100 gms. 85% alcohol dissolve 4.1 gms. at 20°.

(Baup — Ann. chim. phys. [3] 53, 468, '58.)

**SILVER THALLOUS CYANIDE  $\text{AgCN}.\text{TlCN}$ .**

100 gms.  $\text{H}_2\text{O}$  dissolve 4.7 gms. at 0°, and 7.4 gms. at 16°.

(Fronmiller — Ber. 11, 92, '78.)

**SILVER FLUORIDE** AgF.

100 gms. H<sub>2</sub>O dissolve 181.8 gms. at 15.8°. Sp. Gr. of sol. = 2.61.  
(Gore — Proc. Roy. Soc. 28, 158, '70.)

**SILVER FULMINATE** CAg<sub>2</sub>(NO<sub>2</sub>)CN.

One liter of aqueous solution contains 0.075 gm. C<sub>2</sub>Ag<sub>2</sub>N<sub>2</sub>O<sub>2</sub> at 13°, and 0.180 gm. at 30°. (Holleman — Rec. trav. chim. 25, 159, '96.)

**SILVER HEPTOATE** (Önanthylate) AgC<sub>7</sub>H<sub>13</sub>O<sub>2</sub>.

## SOLUBILITY IN WATER.

(Laudau — Monatsh. Ch. 14, 709, '93; Altschul — *Ibid.* 17, 568, '96.)

t°.	Gms. AgC <sub>7</sub> H <sub>13</sub> O <sub>2</sub> per 100 Gms. H <sub>2</sub> O.		t°.	Gms. AgC <sub>7</sub> H <sub>13</sub> O <sub>2</sub> per 100 Gms. H <sub>2</sub> O.	
0	0.0635 (Landau)	0.0436 (Altschul)	50	0.1652 (Landau)	0.0858 (Altschul)
10	0.0817	0.0494	60	0.1906	0.1036
20	0.1007	0.0555	70	0.2185	0.1351
30	0.1206	0.0617	80	0.2495	0.1688
40	0.1420	0.0714			

**SILVER IODATE** AgIO<sub>3</sub>.

One liter of aqueous solution contains 0.04 gram or 0.00014 g. mols. at 18°–20°, and 0.05334 gm. or 0.000189 g. mols. at 25°. (Longi; Böttger; Kohlrausch; Noyes and Kohr — J. Am. Ch. Soc. 24, 1141, '02.)

## SOLUBILITY OF SILVER IODATE IN AQUEOUS SOLUTIONS OF AMMONIA AND OF NITRIC ACID AT 25°.

(Longi — Gazz. chim. ital. 13, 87, '83.)

100 gms. aq. ammonia of 0.998 Sp. Gr. = 5% dissolve 2.36 gms. AgIO<sub>3</sub>.  
100 gms. aq. ammonia of 0.96 Sp. Gr. = 10% dissolve 45.41 gms. AgIO<sub>3</sub>.  
100 gms. aq. nitric acid of 1.21 Sp. Gr. = 35% dissolve 0.096 gm. AgIO<sub>3</sub>.

**SILVER IODIDE** AgI.

One liter of aqueous solution contains 0.0000028 gm. AgI at 20°–25°. (Average of several determinations by Kohlrausch, Abegg and Cox, etc. Holleman gives higher figures.)

1 liter of aq. ammonia of 0.96 Sp. Gr. = 10% dissolve 0.035 gm. AgI at 12°. (Longi.)

## SOLUBILITY OF SILVER IODIDE IN AQUEOUS SALT SOLUTIONS.

(Valenta — Monatsh. Chem. 15, 250, '94; Cohn — Z. physik. Ch. 18, 61, '95.)

Aq. Salt Solution.	t°.	Gms. AgI per 100 Gms. Aq. Solution of Concentration:				
		1:100.	5:100.	10:100.	15:100.	20:100.
Sodium Thio Sulphate	20	0.03	0.15	0.30	0.40	0.60
" " Calc. by Cohn*		0.623	2.996	5.726	8.218	10.493
Potassium Cyanide	25	...	8.28	...	...	...
" " Calc. by Cohn*		...	8.568	...	...	...
Sodium Sulphite	25	...	...	0.01	...	0.02
Ammonium Sulphocyanide	20	...	0.02	0.08	0.13	...
Calcium " "	25	...	...	0.03	...	...
Barium " "	25	...	...	0.02	...	...
Aluminum " "	25	...	...	0.02	...	...
Thio Carbamide	25	...	...	0.79	...	...
Thio Cyanime	25	0.008	0.05	0.09	...	...

\* See Note, page 281.

**SOLUBILITY OF SILVER IODIDE IN AQUEOUS SOLUTIONS OF SODIUM CHLORIDE, POTASSIUM BROMIDE AND OF POTASSIUM IODIDE AT 15°.**

(Schierholz — Sitzb. K. Akad. Wiss. (Vienna) 101, 2b, 10, '90.)

In Sodium Chloride.		In Potassium Iodide.	
Gms. per 100 Gms. Solution.		Gms. per 100 Gms. Solution.	
NaCl.	AgI.	KI.	AgI.
26.31	0.0244	59.16	53.13
25.00	0.00072	57.15	40.0
		50.0	25.0
		40.0	13.0
		33.3	7.33
		25.0	2.75
		21.74	1.576
		20.0	0.80

**In Potassium Bromide.**

Gms. per 100 Gms. Solution.	
KBr	AgI
30.77	0.132

100 gms. sat. silver nitrate solution dissolve 2.3 gms. AgI at 11°, and 12.3 gms. at b. pt.

100 gms. pyridine dissolve 0.10 gm. AgI at 10°, and 8.60 gms. at 121°.

(von Laszcynski — Ber. 27, 2285, '94.)

**SILVER MALATE  $C_6H_4O_2Ag_2$ .**

100 gms.  $H_2O$  dissolve 0.0119 gm. at 18°, and 0.1216 gm. at 25°.

(Partheil and Hübner — Archiv. Pharm. 241, 413, '03.)

**SILVER NITRATE  $AgNO_3$ .**

**SOLUBILITY IN WATER.**

(Etard — Ann. chim. phys. [7] 2, 526, '94; Kremers — Pogg. Ann. 92, 497, '54; Tilden and Shenstone — Phil. Trans. 23, '84.)

t°.	Grams $AgNO_3$ per 100 Gms.			t°.	Grams $AgNO_3$ per 100 Gms.		
	Solution.		Water.		Solution.		Water.
-5	48 (Etard)	..	...	50	79 (Etard)	82	455
0	53	55	122	60	81.5	84	525
10	62	63	170	80	85.5	87	669
20	68	69	222	100	88.5	90½	952
25	70.5	72	257	120	91	95	1900
30	72.5	75	300	140	93.5	...	...
40	76.5	79	376	160	95	...	...

100 gms.  $2HNO_3 \cdot 3H_2O$  dissolve 3.33 gms.  $AgNO_3$  at 20°, and 16.6 gms. at 100°.

100 gms. conc.  $HNO_3$  dissolve 0.2 gm.  $AgNO_3$ .

(Schultz — Zeit. Chem. [2] 5, 531, '69.)

**MUTUAL SOLUBILITY OF SILVER NITRATE AND SODIUM NITRATE IN AQ. ETHYL ALCOHOL.**

(Hissnik — Z. physik. Ch. 32, 557, '00.)

**Results at 25°.**

**Results at 50°.**

(In Aq. Alcohol of $d_{20} 0.945 = 37$ wt. %.)				(In Aq. Alcohol of $d_{17} 0.859 = 75$ wt. %.)			
Gms. per 100 Gms. Sol.		Wt. per cent in Mix Crystals.		Gms. per 100 Gms. Sol.		Wt. per cent in Mix Crystals.	
$AgNO_3$	$NaNO_3$	$AgNO_3$	$NaNO_3$	$AgNO_3$	$NaNO_3$	$AgNO_3$	$NaNO_3$
47.32	0.0	100	0.0	29.78	0.0	100	0.0
44.01	8.78	99.1	0.9	27.9	2.5	99.5	0.5
36.78	20.42	42.9	57.1	26.4	4.2	99.3	0.7
29.97	23.2	33.6	66.4	23.0	6.3	42.9	57.1
24.56	24.82	27.6	72.4	18.3	7.1	31.0	69.0
8.02	26.41	9.9	90.1	9.5	8.3	17.5	82.5
0.0	26.77	0.0	100.0	0.0	8.54	0.0	100.0

## SOLUBILITY OF SILVER NITRATE IN ALCOHOLS.

(de Bruyn — Z. physik. Ch. 10, 783, '92.)

100 gms. abs. methyl alcohol dissolve 3.72 gms. AgNO<sub>3</sub> at 19°.100 gms. abs. ethyl alcohol dissolve 3.10 gms. AgNO<sub>3</sub> at 19°.

## SOLUBILITY OF SILVER NITRATE IN AQUEOUS ETHYL ALCOHOL.

(Eder — J. pr. Ch. [2] 17, 45, '78.)

Sp. Gr. of Aq. Alcoholic Mixture.	Volume per cent Alcohol.	Gms. AgNO <sub>3</sub> per 100 Gms. Aq. Alcohol at:		
		15°.	50°.	75°.
0.815	95	3.8	7.3	18.3
0.863	80	10.3	...	42.0
0.889	70	22.1	...	...
0.912	60	30.5	58.1	89.0
0.933	50	35.8	...	...
0.951	40	56.4	98.3	160.0
0.964	30	73.7	...	...
0.975	20	107.0	214.0	340.0
0.986	10	158.0	...	...

100 gms. of a mixture of 1 vol. (95%) alcohol + 1 vol. ether dissolve 1.6 gms. AgNO<sub>3</sub> at 15°.100 gms. of a mixture of 2 vols. (95%) alcohol + 1 vol. ether dissolve 2.3 gms. AgNO<sub>3</sub> at 15°.100 gms. H<sub>2</sub>O sat. with ether dissolve 88.4 gms. AgNO<sub>3</sub> at 15°.

(Eder.)

100 gms. acetone dissolve 0.35 gm. AgNO<sub>3</sub> at 14°, and 0.44 gm. at 18°.

(von Lasczynski — Ber. 27, 2285, '94; Naumann — Ber. 37, 4332, '04.)

SILVER NITRITE AgNO<sub>2</sub>.

## SOLUBILITY IN AQUEOUS SOLUTIONS OF SILVER NITRATE AT 18°.

(Naumann and Rucker — Ber. 38, 2293, '05.)

Mols. per Liter		Grams per Liter.		Mols. per Liter		Grams per Liter.	
AgNO <sub>3</sub> .	AgNO <sub>2</sub> .	AgNO <sub>3</sub> .	AgNO <sub>2</sub> .	AgNO <sub>3</sub> .	AgNO <sub>2</sub> .	AgNO <sub>3</sub> .	AgNO <sub>2</sub> .
0.0000	0.02067	0.000	3.184	0.02067	0.01435	3.512	2.201
0.00258	0.01975	0.439	3.042	0.04134	0.01168	7.024	1.799
0.00517	0.01900	0.878	2.926	0.08268	0.00961	14.048	1.480
0.01033	0.01689	1.756	2.601				

SILVER OXALATE C<sub>2</sub>O<sub>4</sub>Ag<sub>2</sub>.One liter of H<sub>2</sub>O dissolves 0.035 gm. at 18°, and 0.0365 gm. at 20°.

(Böttger; Kohlrausch.)

SILVER OXIDE Ag<sub>2</sub>O.One liter of H<sub>2</sub>O dissolves 0.021 gm. at 20°, and 0.025 gm. at 25°.

(Noyes and Kohr; Böttger; Abegg and Cox.)

SILVER PERMANGANATE AgMnO<sub>4</sub>.

100 gms. cold water dissolve 0.92 gm.; hot water dissolves more.

(Mitscherlich — Pogg. Ann. 25, 301, '32.)

SILVER PHOSPHATE Ag<sub>3</sub>PO<sub>4</sub>.

One liter of water dissolves 0.00644 gm. at 20°.

(Böttger — Z. physik. Ch. 46, 602, '03.)

# SILVER PROPIONATE

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## SILVER PROPIONATE $C_2H_5COOAg$ .

### SOLUBILITY IN WATER.

(Raupenstrauch — *Monatsh. Ch.* 6, 587, '85; Arrhenius — *Z. physik. Ch.* 11, 396, '93; Goldschmidt — *Ibid.* 25, 93, '98.)

t°	Gms. $C_2H_5O_2Ag$ per Liter.	t°	Gms. $C_2H_5O_2Ag$ per Liter.	t°	Gms. $C_2H_5O_2Ag$ per Liter.
0	5.12	20	8.36 (8.48)	50	13.35
10	6.78	25	9.06	70	17.64
18.2	8.36 (A.)	30	9.93 (9.70)	80	20.30

### SOLUBILITY OF SILVER PROPIONATE IN AQUEOUS SOLUTIONS OF: (Arrhenius.)

Silver Nitrate at 19.7°.				Sodium Propionate at 18.2°.			
Mols. per Liter.		Grams per Liter.		Mols. per Liter.		Grams per Liter.	
$AgNO_3$	$C_2H_5O_2Ag$	$AgNO_3$	$C_2H_5O_2Ag$	$C_2H_5O_2Na$	$C_2H_5O_2Ag$	$C_2H_5O_2Na$	$C_2H_5O_2Ag$
0.0	0.0471	0.0	8.519	0.0	0.0462	0.0	8.362
0.0133	0.0415	2.289	7.511	0.0167	0.0393	1.607	7.114
0.0267	0.0379	4.577	6.86	0.0333	0.0345	3.215	6.244
0.0533	0.0307	9.059	5.556	0.0667	0.0258	6.429	4.670
0.100	0.0222	16.997	4.019	0.1333	0.0191	12.859	3.456
				0.2667	0.0131	25.718	2.371
				0.5000	0.0101	48.77	1.828

## SILVER SALICYLATE $C_6H_4.OH.CO_2Ag$ 1,2.

One liter of aqueous solution contains 0.95 gm. at 23°.

(Holleman — *Z. physik. Ch.* 12, 129, '93.)

## SILVER SUCCINATE $C_4H_4O_4Ag_2$ .

100 gms.  $H_2O$  dissolve 0.0176 gm. at 18°, and 0.0199 gm. at 25°.

(Partheil and Hübner — *Archiv. Pharm.* 241, 413, '03.)

## SILVER SULPHATE $Ag_2SO_4$ .

### SOLUBILITY IN WATER.

(Euler — *Z. physik. Ch.* 49, 314, '04; Wright and Thomson — *Phil. Mag.* [5] 17, 288, '84; Wentzel — *Dammer's "Handbuch"* II, 2, 858; Drucker — *Z. anorg. Ch.* 28, 362, '01.)

t°	Gms. $Ag_2SO_4$ per Liter.	Gm. Mols. $Ag_2SO_4$ per Liter.	
17	7.70	0.0247	(Euler.)
18	7.28	0.0233	(W. and T.)
25	8.01	0.0257	(D.)
100	14.60	...	(W.)

One liter of aqueous solution in contact with a mixture of silver sulphate and silver acetate contains 3.95 gms.  $Ag_2SO_4$  + 8.30 gms.  $CH_3COOAg$  at 17°. Sp. Gr. of solution = 1.0094. (Euler.)

### SOLUBILITY OF SILVER SULPHATE AT 25° IN AQUEOUS SOLUTIONS OF: (Drucker.)

Sulphuric Acid.				Potassium Sulphate.			
Mols. per Liter.		Grams per Liter.		Mols. per Liter.		Grams per Liter.	
$Ag_2SO_4$	$H_2SO_4$	$Ag_2SO_4$	$H_2SO_4$	$Ag_2SO_4$	$K_2SO_4$	$Ag_2SO_4$	$K_2SO_4$
0.0260	0.02	8.11	0.98	0.0246	0.02	7.67	1.74
0.0264	0.04	8.23	1.96	0.0236	0.04	7.36	3.49
0.0271	0.10	8.45	4.90	0.0231	0.10	7.20	8.72
0.0275	0.20	8.58	9.81	0.0232	0.20	7.24	17.44

**SOLUBILITY OF SILVER SULPHATE AT 18° IN AQUEOUS SOLUTIONS OF:**

(Eder — J. pr. Ch. [2] 17, 44, '78.)

**Ammonium Sulphate. Potassium Sulphate. Sodium Sulphate.**

Gms. per 100 Gms. Solution.		Gms. per 100 Gms. Solution.		Gms. per 100 Gms. Solution.	
(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub> .	Ag <sub>2</sub> SO <sub>4</sub> .	K <sub>2</sub> SO <sub>4</sub> .	Ag <sub>2</sub> SO <sub>4</sub> .	Na <sub>2</sub> SO <sub>4</sub> .	Ag <sub>2</sub> SO <sub>4</sub> .
5	0.66	6	0.60	12	0.65
15	0.85	18	0.76	32	0.80

**SILVER SULPHOCYANIDE AgSCN.**

One liter of aqueous solution contains 0.0002 gm. at 25°, and 0.0064 gm. at 100°.

(Abegg and Cox — Z. physik. Ch. 46, 11, '03; Böttger — *Ibid.* 46, 60, '05; 56, 93, '06.)

**SOLUBILITY OF MIXTURES OF SILVER THIOCYANATE AND POTASSIUM THIOCYANATE IN WATER AT 25°.**

(Foote — Am. Ch. J. 30, 332, '03.)

Gms. per 100 Gms. Solution.		Mols. per 100 Mols. H <sub>2</sub> O.		Solid Phase.
KSCN.	AgSCN.	KSCN.	AgSCN.	
70.53	...	44.36	...	KSCN
66.55	9.32	51.13	4.19	KSCN + 2KSCN.AgSCN
64.47	10.62	47.98	4.60	Double Salt. 2KSCN.AgSCN = 53.92% KSCN
61.25	11.76	42.07	4.72	
58.34	13.55	38.47	5.23	
53.21	17.53	33.71	6.50	2KSCN.AgSCN + KSCN.AgSCN
50.68	20.43	32.52	7.67	Double Salt. KSCN.AgSCN = 36.9% KSCN
49.43	20.32	30.29	7.28	
32.51	18.34	12.26	4.05	
24.68	16.41	7.77	3.02	KSCN.AgSCN + AgSCN
23.86	16.07	7.36	2.90	

**SILVER TARTRATE C<sub>4</sub>H<sub>4</sub>O<sub>6</sub>Ag<sub>2</sub>.**

100 gms. H<sub>2</sub>O dissolve 0.2012 gm. C<sub>4</sub>H<sub>4</sub>O<sub>6</sub>Ag<sub>2</sub> at 18°, and 0.2031 gm. at 25°.

(Partheil and Hübner — Archiv. Pharm. 241, 413, '03.)

**SILVER VALERATES AgC<sub>5</sub>H<sub>9</sub>O<sub>2</sub>.**

**SOLUBILITY IN WATER.**

Normal Valerate      Iso Valerate  
CH<sub>3</sub>(CH<sub>2</sub>)<sub>3</sub>COOAg.      CH<sub>3</sub>CH(CH<sub>3</sub>)<sub>2</sub>CH<sub>2</sub>COOAg.  
(Fürth — Monatsh. Ch. 9, 311, '88; Sedlitzky — *Ibid.* 8, 563, '87.)

t°.	Gms. per 100 Gms. H <sub>2</sub> O.		t°.	Gms. per 100 Gms. H <sub>2</sub> O.	
	Normal V.	Iso V.		Normal V.	Iso V.
0	0.229	0.177	50	0.474	0.360
10	0.259	0.211	60	0.552	0.401
20	0.300	0.246	70	0.636	0.443
30	0.349	0.283	80	...	0.486
40	0.408	0.321			

100 gms. H<sub>2</sub>O dissolve 0.73 gm. silver valerate at 20°.

(Markwald — Ber. 32, 1080, '99.)

# SILVER VALERATE

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## SOLUBILITY OF SILVER VALERATE IN AQUEOUS SOLUTIONS OF SILVER ACETATE, SILVER NITRATE AND OF SODIUM VALERATE.

(Arrhenius — Z. physik. Ch. 11 396, '93.)

### In Silver Acetate at 17.8°.

Mols. per Liter.		Gms. per Liter.	
$C_2H_3O_2Ag.$	$C_2H_5O_2Ag.$	$C_2H_3O_2Ag.$	$C_2H_5O_2Ag.$
0.0	0.0094	0.0	1.96
0.0067	0.0070	1.13	1.46
0.0135	0.0057	2.27	1.19
0.0270	0.0037	4.54	0.77
0.0505	0.00265	8.48	0.55

### In Silver Nitrate at 16.5°.

Mols. per Liter.		Gms. per Liter.	
$AgNO_3.$	$C_2H_5O_2Ag.$	$AgNO_3.$	$C_2H_5O_2Ag.$
0.0	0.0094	0.0	1.96
0.0067	0.0068	1.14	1.42
0.0133	0.0051	2.29	1.07
0.0267	0.0031	4.58	0.65
0.1000	0.0012	17.00	0.25

### In Sodium Valerate at 18.6°.

Mols. per Liter.		Grams. per Liter.	
$C_2H_3O_2Na.$	$C_2H_5O_2Ag.$	$C_2H_3O_2Na.$	$C_2H_5O_2Ag.$
0.0	0.0095	0.0	1.986
0.0175	0.0047	2.17	0.982
0.0349	0.0030	4.32	0.627
0.0698	0.0018	8.65	0.376
0.1395	0.0015	17.31	0.313

# SILVER VANADATE $Ag_2V_4O_{13}$ .

One liter of aqueous solution contains 0.047 gram at 14°, and 0.073 gm. at 100°.

(Carnelly — Liebigs Ann. 166, 155, '73.)

# SODIUM ACETATE $CH_3COONa.3H_2O$ .

## SOLUBILITY IN WATER.

Interpolated from original.

(Schiavor — Gazz. chim. ital. 32, II, 532, '02.)

t°.	Gms. $CH_3COONa$ per 100 Gms.		t°.	Gms. $CH_3COONa$ per 100 Gms.	
	Water.	Solution.		Water.	Solution.
0	34	25.4	25	53	34.7
10	41	29.1	30	57	36.3
20	49	32.9	40	65	39.4

100 gms.  $H_2O$  dissolve 46.9 gms.  $CH_3COONa$  at 31.5°.

(Köhler — Z. Ver. Zuckerind. 47, 447, '97.)

100 cc. aqueous solution contain 41.11 gms.  $CH_3COONa$  at 10°.

(Enklaar.)

## SOLUBILITY OF SODIUM ACETATE IN AQUEOUS SOLUTIONS OF ACETIC ACID.

(Enklaar — Rec. trav. chim. 20, 183, '01.)

Gram Mols. per Liter.		Grams per Liter.	
$CH_3COOH.$	$CH_3COONa.$	$CH_3COOH.$	$CH_3COONa.$
0	5.0	0.0	411.1
0.085	5.0	5.1	410.3
0.12	5.0	7.2	410.4

## SOLUBILITY OF SODIUM ACETATE IN ABSOLUTE ALCOHOL AT ROOM TEMPERATURE.

(Böttker — Z. physik. Ch. 22, 510, '97.)

100 gms. alcohol dissolve 1.81 gms.  $CH_3COONa$  or 7.49 gms.  $CH_3COONa.3H_2O$ .

## SOLUBILITY OF SODIUM ACETATE IN AQUEOUS ALCOHOL:

At 18°.

At Different Temperatures.

(Gerardin — Ann. chim. phys. [4] 5, 158, '65.)

(Schiavor.)

Wt. per cent Alcohol.	Gms. CH <sub>3</sub> COONa per 100 Gms. Aq. Alcohol.	t°.	Degree of Alcohol.	Gms. per 100 Gms. Alcohol.	
				CH <sub>3</sub> COONa.	CH <sub>3</sub> COONa.3H <sub>2</sub> O.
5.2	38.0	8	98.4	2.08	3.45
9.8	35.9	12	98.4	2.12	3.51
23.0	29.8	19	98.4	2.33	3.86
29.0	27.5	11	90	2.07	3.42
38.0	23.5	13	90	2.13	3.52
45.0	20.4	15	63	13.46	22.32
59.0	14.6	18	63	13.88	23.03
86.0	3.9	21	63	14.65	24.30
91.0	2.1	23	40	28.50	47.27

100 gms. H<sub>2</sub>O dissolve 237.6 gms. sugar + 57.3 grams CH<sub>3</sub>COONa, or 100 gms. of the saturated solution contain 58.93 gms. sugar + 14.44 gms. CH<sub>3</sub>COONa at 31.25°.

(Köhler.)

SODIUM ARSENATE Na<sub>2</sub>AsO<sub>4</sub>.12H<sub>2</sub>O.

100 grams aqueous solution contain 21.1 grams Na<sub>2</sub>AsO<sub>4</sub>.12H<sub>2</sub>O. (= 10.4 gms. Na<sub>2</sub>AsO<sub>4</sub>) at 17°. Sp. Gr. of solution = 1.1186.

(Schiff — Liebig's Ann. 113, 350, '60.)

100 grams glycerine dissolve 50 gms. sodium arsenate at 15.5°.

(Pharm. Centralh. No. 30, '81.)

SODIUM HYDROGEN ARSENATE Na<sub>2</sub>HAsO<sub>4</sub>.12H<sub>2</sub>O.

100 gms. H<sub>2</sub>O dissolve 17.2 gms. Na<sub>2</sub>HAsO<sub>4</sub>.12H<sub>2</sub>O (= 7.3 gms. anhydrous) at 0°. 56.0 gms. (= 19.89 gms. anhydrous) at 14°. Sp. Gr. 1.1722, 37.0 gms. anhydrous at 21°, and 140.7 gms. hydrated at 30°.

(Schiff — Liebig's Ann. 113, 350, '60; Tilden — J. Ch. Soc. 45, 409, '84.)

SODIUM BENZOATE C<sub>6</sub>H<sub>5</sub>COONa.

100 gms. H<sub>2</sub>O dissolve 62 gms. at 25°, and 77 gms. at b. pt.

100 gms. alcohol dissolve 2.3 gms. at 25°, and 8.3 gms. at b. pt.

(U. S. P.)

SODIUM (Tetra) BORATE Na<sub>2</sub>B<sub>4</sub>O<sub>7</sub>.10H<sub>2</sub>O (Borax).

## SOLUBILITY IN WATER.

(Horn and Van Wagener — Am. Ch. J. 30, 347, '03.)

t°.	Gms. Na <sub>2</sub> B <sub>4</sub> O <sub>7</sub> per 100 Gms. H <sub>2</sub> O.	t°.	Gms. Na <sub>2</sub> B <sub>4</sub> O <sub>7</sub> per 100 Gms. H <sub>2</sub> O.	t°.	Gms. Na <sub>2</sub> B <sub>4</sub> O <sub>7</sub> per 100 Gms. H <sub>2</sub> O.	
5	1.3	50	10.5	60	19.4	20.3
10	1.6	54	13.3	62	22.0	20.7
21.5	2.8	55	14.2	65	22.0	21.9
30	3.9	56	15.0	70		24.4
37.5	5.6	57	16.0	80		31.5
45	8.1			90		41.0
				100		52.5

Transition temperature Na<sub>2</sub>B<sub>4</sub>O<sub>7</sub>.10H<sub>2</sub>O → Na<sub>2</sub>B<sub>4</sub>O<sub>7</sub>.5H<sub>2</sub>O approximately 62°. Sp. Gr. of saturated solution at 15° = 1.032. (Gerlach.)



# SODIUM BORATES

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## SOLUBILITY OF SODIUM BORATES IN WATER AT 30°.

(Dukelski — Z. anorg. Ch. 50, 42, '06, complete references given.)

Gms. per 100 Gms. Solution.		Gms. per 100 Gms. Residue.		Solid Phase.
K <sub>2</sub> O.	B <sub>2</sub> O <sub>3</sub> .	K <sub>2</sub> O.	B <sub>2</sub> O <sub>3</sub> .	
42.0	...	...	...	NaOH.H <sub>2</sub> O
41.37	5.10	43.54	4.19	"
38.85	5.55	37.20	11.18	Na <sub>2</sub> O.B <sub>2</sub> O <sub>3</sub> .4H <sub>2</sub> O
34.44	3.73	33.52	10.80	"
29.39	2.51	29.63	10.11	"
26.13	2.75	27.85	15.21	"
23.00	3.82	24.91	11.60	"
16.61	13.69	21.29	20.64	"
21.58	4.63	24.52	19.04	Na <sub>2</sub> O.B <sub>2</sub> O <sub>3</sub> .4H <sub>2</sub> O + Na <sub>2</sub> O.B <sub>2</sub> O <sub>3</sub> .8H <sub>2</sub> O
20.58	4.69	21.61	16.59	Na <sub>2</sub> O.B <sub>2</sub> O <sub>3</sub> .8H <sub>2</sub> O
15.32	6.21	19.70	17.84	"
12.39	9.12	18.05	18.17	"
8.85	10.49	11.72	20.62	Na <sub>2</sub> O.2B <sub>2</sub> O <sub>3</sub> .10H <sub>2</sub> O
5.81	6.94	10.82	21.31	"
1.88	2.41	7.31	15.50	"
1.38	5.16	7.16	17.44	"
2.02	7.79	6.24	16.38	"
4.08	17.20	8.96	29.20	Na <sub>2</sub> O.3B <sub>2</sub> O <sub>3</sub> .10H <sub>2</sub> O + Na <sub>2</sub> O.5B <sub>2</sub> O <sub>3</sub> .10H <sub>2</sub> O
3.79	15.84	5.68	28.19	Na <sub>2</sub> O.5B <sub>2</sub> O <sub>3</sub> .10H <sub>2</sub> O
2.26	12.14	5.21	29.19	"
1.99	11.84	5.74	39.66	Na <sub>2</sub> O.2B <sub>2</sub> O <sub>3</sub> .10H <sub>2</sub> O + B(OH) <sub>3</sub>
1.86	11.18	1.06	28.78	B(OH) <sub>3</sub>
0.64	6.11	0.31	31.19	"
...	3.54	...	...	"

100 gms. alcohol of 0.941 Sp. Gr. dissolve 2.48 gms. sodium borate at 15.5°.

100 gms. glycerine dissolve 60.3 gms. at 15.5°, and 100 gms. at 80°.  
(U.S.P.)

Gaudolphe — J. pharm. chim. [4] 22, 366, '75 — says that glycerine dissolves its weight of sodium borate at ordinary temperatures.

# SODIUM BROMATE NaBrO<sub>3</sub>.

## SOLUBILITY IN WATER.

(Kremers — Pogg. Ann. 94, 271, 55; 97, 5, '56.)

t °.	0°	20°	40°	60°	80°	100°
Gms. NaBrO <sub>3</sub> per 100 Gms. H <sub>2</sub> O	27.5	34.5	50.2	62.5	75.7	90.9

Sp. Gr. of saturated solution at 19.5° = 1.231.

(Gerlach.)

**SODIUM BROMIDE**  $\text{NaBr} \cdot 2\text{H}_2\text{O}$ .**SOLUBILITY IN WATER.**(Etard — *Compt. rend.* 98, 1432, '84; de Coppet — *Ann. chim. phys.* [5] 30, 411, '83.)

t°.	Grams NaBr per 100 Gms. $\text{H}_2\text{O}$ .		t°.	Grams NaBr per 100 Gms. $\text{H}_2\text{O}$ .	
-20	57.5*	71.4†	50	95-112*	116†
0	66	79.5	60	112	117
10	72	84.5	80	113	119
20	77	90.3	100	114	121
30	82.5	97.3	120	116	124
40	88.0	105.8	140	118	...

\* Etard.

† de Coppet.

Transition temperature for  $\text{NaBr} \cdot 2\text{H}_2\text{O} \rightarrow \text{NaBr}$  is approximately 50°. Kremers — *Pogg. Ann.* 97, 14, '56 — gives results which fall near those of de Coppet for the  $\text{NaBr} \cdot 2\text{H}_2\text{O}$ , and near those of Etard for the NaBr section of the curve.

**SOLUBILITY OF SODIUM BROMIDE IN AQUEOUS SOLUTIONS OF SODIUM HYDROXIDE AT 17°.**(Ditte — *Compt. rend.* 124, 30, '97.)

Gms. per 100 Gms. $\text{H}_2\text{O}$ .		Gms. per 100 Gms. $\text{H}_2\text{O}$ .		Gms. per 100 Gms. $\text{H}_2\text{O}$ .	
NaOH.	NaBr.	NaOH.	NaBr.	NaOH.	NaBr.
0.0	91.38	17.17	63.06	28.43	48.00
3.26	79.86	19.12	62.51	36.61	38.41
9.24	68.85	22.35	59.60	46.96	29.37
13.43	64.90	24.74	55.03	54.52	24.76

**SOLUBILITY OF SODIUM BROMIDE IN ALCOHOLIC SOLUTIONS.**(Rohland — *Z. anorg. Ch.* 18 327, '98; *Z. anal. Ch.* 44, 252, '05; de Bruyn — *Z. physik. Ch.* 10, 783 '92; Eder — *Dingl. polyt.* 221, 89, '75.)

Alcohol.	Concentration of Aq. Alcohol.	t°.	Gms. NaBr per 100 Gms. Alcohol.	
Methyl Alcohol	$d_{15} = 0.799$	room temp.	21.7	(R.)
Ethyl "	$d_{15} = 0.810$	"	7.14	"
Propyl "	$d_{15} = 0.816$	"	2.01	"
Ethyl "	90% by vol.	?	4.0	(hydrated NaBr)
Methyl "	Absolute	19.5	17.35	(de Bruyn.)
Ethyl "	"	15	6.3	( $\text{NaBr} \cdot 2\text{H}_2\text{O}$ ) (Eder.)
Ethyl Ether	"	15	0.08	"

## SODIUM CARBONATE

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SODIUM CARBONATE  $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$ .

## SOLUBILITY IN WATER.

(Mulder; Löwel — Ann. chim. phys. [3] 33, 382, '51; at 15°, Reich — Monatsh. Ch. 12, 464, '91; at 32–34.5°  $\text{Na}_2\text{CO}_3 \cdot 7\text{H}_2\text{O}$  b, Ketner — Z. physik. Ch. 39, 646, '01–'02.)

## Solid Phase:

t°.	$\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$ Gms. $\text{Na}_2\text{CO}_3$ per 100 Gms.		$\text{Na}_2\text{CO}_3 \cdot 7\text{H}_2\text{O}$ (b). $\text{Na}_2\text{CO}_3 \cdot 7\text{H}_2\text{O}$ (a). Gms. $\text{Na}_2\text{CO}_3$ per 100 Gms.			
	Water.	Solution.	Water.	Solution.	Water.	Solution.
0	7.0	6.5	20.4	16.9	32.0	24.2
5	9.5	6.9	23.2	18.8	35.0	25.9
10	12.5	11.1	26.2	20.8	37.8	27.4
15	16.4	14.1	29.5	22.8	41.2	29.2
20	21.5	17.7	33.5	25.1	45.5	31.3
25	28.2 (29.8*)	22.0	38.0	27.5		
30	37.8 (40.9*)	27.4	43.5	30.3		
32.5	46.2	31.6	(32.1°) 46.6	31.8		
			(33.3°) 48.6	32.7		
35	46.2	31.6	(34.5°) 51.3	33.9		
40	46.1 (49.7*)	31.5	Solid Phase $\text{Na}_2\text{CO}_3 \cdot \text{H}_2\text{O}$			
60	46.0 (46.4*)	31.5				
80	45.8 (45.2*)	31.4				
100	45.5	31.3				
105	45.2	31.1				

\* Epple — Dissertation, Heidelberg, p. 26, 1899.

Sp. Gr. of solution saturated at 17.5°, 1.165 (Hager); at 18°, 1.172 (Kohlrausch); at 23°, 1.222 (Schiff); at 30°, 1.342 (Lunge). See also Wegschroeder and Waller — Monatsh. Chem. 26, 685, '05, for Sp. Gr. determinations at other temperatures.

SOLUBILITY OF SODIUM CARBONATE IN AQUEOUS SOLUTIONS  
OF SODIUM CHLORIDE AT 15°.

(Reich.)

Gms. per 100 Gms. $\text{H}_2\text{O}$ .		Gms. NaCl Gms. $\text{Na}_2\text{CO}_3$ per 100 per 100 Gms.		Gms. per 100 Gms. $\text{H}_2\text{O}$ .		Gms. NaCl Gms. $\text{Na}_2\text{CO}_3$ per 100 per 100 Gms.	
NaCl.	$\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$	Gms. Solution.	NaCl Solution.	NaCl.	$\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$	Gms. Solution.	NaCl Solution.
0.0	61.42	0.0	16.42	23.70	39.06	15.96	9.76
4.03	53.86	2.92	14.47	27.93	39.73	18.26	9.62
8.02	48.00	5.80	12.87	31.65	41.44	20.06	9.73
12.02	43.78	8.61	11.62	35.46	43.77	21.75	7.95
16.05	40.96	11.31	10.70	37.23	45.27*	22.46	10.13
19.82	39.46	13.71	10.11				

\* Both salts in solid phase.

SOLUBILITY OF SODIUM CARBONATE IN AQUEOUS SOLUTIONS  
OF ETHYL AND OF PROPYL ALCOHOL AT 20°.

(Linebarger — Am. Ch. J. 14, 380, '92.)

Wt. per cent Alcohol.	Gms. $\text{Na}_2\text{CO}_3$ per 100 Gms. Sol.		Wt. per cent Alcohol.	Gms. $\text{Na}_2\text{CO}_3$ per 100 Gms. Sol.	
	In Ethyl.	In Propyl.		In Ethyl.	In Propyl.
28	...	4.4	48	0.9	1.3
38	...	2.7	50	0.84	1.2
44	1.7	1.7	54	0.80	0.9
46	1.13	1.5	62	...	0.4

**SOLUBILITY OF SODIUM CARBONATE IN AQUEOUS SOLUTIONS OF ETHYL ALCOHOL.**

(Ketner — Z. physik. Ch. 39, 646, '01-'02.)

NOTE.—The mixtures were so made that an alcoholic and an aqueous layer were formed, and these were brought into equilibrium with the solid phase.

t°.	Gms. per 100 Gms. Alcoholic Layer.			Gms. per 100 Gms. Aq. Layer.			Solid Phase.
	C <sub>2</sub> H <sub>5</sub> OH.	Na <sub>2</sub> CO <sub>3</sub> .	H <sub>2</sub> O.	C <sub>2</sub> H <sub>5</sub> OH.	Na <sub>2</sub> CO <sub>3</sub> .	H <sub>2</sub> O.	
35	62.9	0.3	36.8	1.0	32.4	66.6	Na <sub>2</sub> CO <sub>3</sub> ·H <sub>2</sub> O
40	61.0	0.4	38.6	1.2	31.9	66.9	"
49	61.0	0.4	38.6	1.2	31.5	67.3	"
68	55.8	0.9	43.3	2.3	28.8	68.9	"
31.2	52.4	0.8	46.8	...	29.3	...	Na <sub>2</sub> CO <sub>3</sub> ·7H <sub>2</sub> O (b)
31.9	54.8	0.7	44.5	1.7	29.8	68.5	"
32.3	56.1	0.6	43.3	1.5	30.2	68.3	"
33.2	58.1	0.5	42.4	1.4	31.0	67.6	"
27.7	Crit. sol. ± 14% C <sub>2</sub> H <sub>5</sub> OH ± 13% Na <sub>2</sub> CO <sub>3</sub> ± 73% H <sub>2</sub> O						
28.2	23.5	7.3	69.2	7.9	18.6	73.5	Na <sub>2</sub> CO <sub>3</sub> ·10H <sub>2</sub> O
29.0	32.7	3.8	63.5	4.3	22.7	73.0	"
29.7	40.0	2.1	57.9	2.9	25.5	71.6	"
30.6	47.8	1.2	51.0	2.3	27.8	69.9	"

**SOLUBILITY OF Na<sub>2</sub>CO<sub>3</sub>·10H<sub>2</sub>O IN DILUTE ALCOHOL AT 21°.**

(Ketner.)

Grams per 100 Grams Solution.			Grams per 100 Grams Solution.		
Na <sub>2</sub> CO <sub>3</sub> .	C <sub>2</sub> H <sub>5</sub> OH.	H <sub>2</sub> O.	Na <sub>2</sub> CO <sub>3</sub> .	C <sub>2</sub> H <sub>5</sub> OH.	H <sub>2</sub> O.
18.5	0.0	81.5	1.2	39.2	59.6
12.7	6.2	81.1	0.2	58.2	41.6
6.9	15.3	77.8	0.1	67.1	32.8
3.2	26.1	70.7	0.06	73.3	26.64

100 gms. saturated solution in glycol contain 3.28–3.4 gms. sodium carbonate.

(de Coninck — Bull. acad. roy. Belgique, 359, '05.)

100 gms. H<sub>2</sub>O dissolve 229.2 gms. sugar + 24.4 gms. Na<sub>2</sub>CO<sub>3</sub>, or 100 gms. sat. aq. solution contain 64.73 gms. sugar + 6.89 gms. Na<sub>2</sub>CO<sub>3</sub>.

(Köhler — Z. Ver. Zuckerind. 47, 447, '97.)

**SODIUM (Bi) CARBONATE NaHCO<sub>3</sub>.**

**SOLUBILITY IN WATER.**

(Dibbitts — J. pr. Ch. [2] 10, 439, '74.)

t°.	Gms. NaHCO <sub>3</sub> per 100 Gms.		t°.	Gms. NaHCO per 100 Gms.	
	Water.	Solution.		Water.	Solution.
0	6.9	6.5	30	11.1	10.0
10	8.15	7.5	40	12.7	11.3
20	9.6	8.8	50	14.45	12.6
25	10.35	9.4	60	16.4	13.8

Sp. Gr. of sat. solution at 16° = 1.069.

100 gms. alcohol of 0.941 Sp. Gr. dissolve 1.2 gms. NaHCO<sub>3</sub> at 15.5°.

100 gms. glycerine dissolve 8 gms. NaHCO<sub>3</sub> at 15.5°.

(Stolba.)

## SODIUM (Bi) CARBONATE 298

### SOLUBILITY OF SODIUM BICARBONATE IN AQUEOUS AMMONIUM BICARBONATE SOLUTIONS SATURATED WITH CO<sub>2</sub>.

(Fedotieff — Z. physik. Ch. 49, 169, '04.)

t°.	Wt. of 1 cc. Solution.	Mols. per 1000 Gms. H <sub>2</sub> O.		Grams per 1000 Gms. H <sub>2</sub> O.	
		NH <sub>4</sub> HCO <sub>3</sub> .	NaHCO <sub>3</sub> .	NH <sub>4</sub> HCO <sub>3</sub> .	NaHCO <sub>3</sub> .
0	1.072	1.39	0.58	109.4	48.2
"	...	0.0	0.82	0.0	69.0
15	1.056	0.0	1.05	0.0	88.0
"	1.061	0.29	0.95	23.0	80.0
"	1.065	0.56	0.89	44.0	74.6
"	1.073	1.08	0.79	85.7	66.7
"	1.090	2.16	0.71	170.6	59.2
30	...	0.0	1.65	0.0	138.6
"	...	2.91	0.83	23.0	70.0

### SOLUBILITY OF SODIUM BICARBONATE IN AQUEOUS SOLUTIONS OF SODIUM CHLORIDE SATURATED WITH CO<sub>2</sub>.

(Fedotieff; see also Reich — Monath. Ch. 12, 464, '91.)

t°.	Wt. of 1 cc. Solution.	Mols. per 1000 Gms. H <sub>2</sub> O.		Grams per 1000 Gms. H <sub>2</sub> O.	
		NaCl.	NaHCO <sub>3</sub> .	NaCl.	NaHCO <sub>3</sub> .
0	...	0.0	0.82	0.0	69.0
"	1.208	6.0	0.09	350.1	7.7
15	1.056	0.0	1.05	0.0	88.0
"	1.063	0.52	0.82	30.2	68.6
"	1.073	1.03	0.64	60.1	53.6
"	1.096	2.11	0.41	123.1	34.8
"	1.127	3.20	0.28	187.2	23.0
"	1.158	4.39	0.19	256.9	16.1
"	1.203	6.06	0.12	354.6	10.0
30	1.066	0.0	1.31	0.0	110.2
"	1.079	1.02	0.87	59.9	72.8
"	1.100	2.08	0.56	121.9	47.3
"	1.127	3.18	0.38	186.3	32.0
"	1.156	4.38	0.27	256.0	22.3
"	1.199	6.12	0.17	358.1	13.9
45	1.077	0.0	1.65	0.0	138.6
"	1.086	1.04	1.12	60.7	94.0
"	1.115	2.65	0.62	155.2	52.0
"	1.127	3.24	0.52	189.4	43.4
"	1.155	4.38	0.37	256.1	30.7
"	1.198	6.18	0.23	361.5	19.5

100 grams alcohol of 0.941 Sp. Gr. dissolve 5.55 grams sodium sulpho carbonate at 15.5°.

## SODIUM CHLORATE NaClO<sub>3</sub>.

### SOLUBILITY IN WATER.

(Kremers — Pogg. Ann. 97, 4, '56.)

t°.	Grams per 100 Grams		t°.	Grams per 100 Grams	
	Water.	Solution.		Water.	Solution.
0	81.9	45.0	60	147.1	59.5
12	89.3	47.2	80	175.6	63.7
20	99.0	49.7	100	232.6	69.9
40	123.5	55.3	120	333.3	76.9

### SOLUBILITY OF SODIUM CHLORATE IN AQUEOUS SODIUM CHLORIDE SOLUTIONS AT 20°.

(Winteler — Z. Electrochem. 7, 360, '00.)

Volume Wt. of Solutions.	Grams per Liter.		Volume Wt. of Solutions.	Grams per Liter.	
	NaCl.	NaClO <sub>3</sub> .		NaCl.	NaClO <sub>3</sub> .
1.426	5	668	1.365	175	393
1.419	25	638	1.345	200	338
1.412	50	599	1.319	225	271
1.405	75	559	1.289	250	197
1.398	100	522	1.256	275	120
1.389	125	484	1.235	290	78
1.379	150	442	1.217	300	55

100 gms. H<sub>2</sub>O dissolve 24.4 gms. NaCl + 50.75 gms. NaClO<sub>3</sub> at 12°.100 gms. H<sub>2</sub>O dissolve 11.5 gms. NaCl + 249.6 gms. NaClO<sub>3</sub> at 122°.

(Schlosing — Compt. rend. 73, 1273, '71.)

100 gms. alcohol of 77 Wt. per cent dissolve 2.9 gms. NaClO<sub>3</sub> at 16°.

(Wittstein.)

100 gms. alcohol dissolve 1 gm. NaClO<sub>3</sub> at 25°, and 2.5 gms. at b. pt.100 gms. glycerine dissolve 20 gms. NaClO<sub>3</sub> at 15.5°.

### SODIUM CHLORIDE NaCl.

#### SOLUBILITY IN WATER.

(Mulder; de Coppet — Ann. chim. phys. [5] 30, 411, '83; Andrae — J. pr. Ch. [2] 29, 456, '84; above 100°, Tilden and Shenstone — Phil. Trans. 23, '84; Berkeley — Trans. Roy. Soc. (Lond.) 203 A, 206, '04; Etard — Ann. chim. phys. [7] 2, 527, '94, gives irregular results.)

°.	Gms. NaCl per 100 Gms. H <sub>2</sub> O.		Gms. NaCl per 100 g. Sol.	°.	Gms. NaCl per 100 Gms. H <sub>2</sub> O.		Gms. NaCl per 100 g. Sol.
0	35.7*	35.63†	26.28†	70	37.8*	37.51†	27.27†
10	35.8	35.69	26.29	80	38.4	38.00	27.54
20	36.0	35.82	26.37	90	39.0	38.52‡	27.80
25	36.12	35.92	26.43	100	39.8	39.12‡	28.12
30	36.3	36.03	26.49	118		39.8	28.46
40	36.6	36.32	26.65	140		42.1	29.63
50	37.0	36.67	26.83	160		43.6	30.37
60	37.3	37.06	27.04	180		44.9	30.98

\* M.; de C.

† A.

‡ B.

### SOLUBILITY OF SODIUM CHLORIDE IN AQUEOUS SOLUTIONS OF AMMONIUM CHLORIDE.

(Fedotieff — Z. physik. Ch. 49, 170, '04.)

°.	Wt. of 1 cc. Solution.	Mols. per 1000 Gms. H <sub>2</sub> O.		Grams per 1000 Gms. H <sub>2</sub> O.	
		NH <sub>4</sub> Cl.	NaCl.	NH <sub>4</sub> Cl.	NaCl.
0	...	0.0	6.09	0.0	356.3
"	1.185	2.73	4.89	146.1	286.4
15	1.200	0.0	6.12	0.0	357.6
"	1.191	1.07	5.58	57.3	326.4
"	1.183	2.22	5.13	118.9	300.0
"	1.176	3.48	4.64	186.4	271.6
"	1.175	3.72	4.55	198.8	266.8
30	...	0.0	6.16	0.0	360.3
"	1.166	4.77	4.26	255.4	249.0
45	...	0.0	6.24	0.0	365.0
"	...	6.02	4.0	322.1	233.9

# SODIUM CHLORIDE

300

## SOLUBILITY OF SODIUM CHLORIDE IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID.

(Engel — Ann. chim. phys. [6] 13, 374, '88; Enklaar — Rec. trav. chim. 20, 183, '01.)

At °. (Engel.)				At 10°-10.5°. (Enklaar.)				
Mg. Mols. per 10 cc.		Sp. Gr. of Solution.	Gms. per Liter.		Mols. per Liter.		Grams per Liter.	
HCl.	NaCl.		HCl.	NaCl.	HCl.	NaCl.	HCl.	NaCl.
0.0	54.7	1.207	0.0	32.0	0.0	6.11	0.0	35.77
1.0	53.5	1.204	0.365	31.3	0.27	5.77	9.84	33.76
1.85	52.2	1.202	0.674	30.5	0.35	5.67	12.76	33.19
5.1	48.5	1.196	1.859	28.4	0.43	5.59	15.68	32.71
9.28	44.0	1.185	3.38	25.7	0.57	5.43	20.78	31.77
15.05	37.9	1.173	5.49	22.2	0.72	5.28	26.06	30.89
30.75	23.5	1.141	11.20	13.7	2.60	3.42	94.77	20.01
56.35	6.1	1.119	20.54	3.6	2.80	3.18	102.1	19.04
					3.31	2.74	120.6	16.03

## SOLUBILITY OF MIXTURES OF SODIUM CHLORIDE AND OTHER SALTS IN WATER, ETC.

Solvent.	t°.	Gms. per 100 Gms. Solvent.	Authority.
Water	17	26.4 NaCl + 22.1 NH <sub>4</sub> Cl*	(Karsten.)
"	17	34.5 " + 4.1 BaCl <sub>2</sub>	"
"	?	38.3 " + 29.5 KNO <sub>3</sub>	"
"	25	38.5 " + 41.14 "	(Soch — J. Physic. Ch. 2, 46, '98.)
"	80	39.81 " + 168.8 "	"
Alcohol (40%)	25	15.78 " + 13.74 "	"
Water	20	30.54 " + 13.95 KCl	(Quoted by Euler — Z. physik. Ch. 49, 315, '04.)
"	25	28.90 " + 16.12 "	

\* Sp. Gr. of solution at 17° = 1.179.

## SOLUBILITY OF MIXTURES OF SODIUM CHLORIDE AND POTASSIUM SULPHATE IN WATER AT VARIOUS TEMPERATURES.

(Precht and Wittgen — Ber. 15, 1666, '82.)

t°.	Grams per 100 Grams H <sub>2</sub> O.			t°.	Grams per 100 Grams H <sub>2</sub> O.		
	NaCl	K <sub>2</sub> SO <sub>4</sub>	KCl		NaCl	K <sub>2</sub> SO <sub>4</sub>	KCl
10	33.4	8.1	3.2	60	36.4	11.9	2.7
20	34.0	8.9	3.1	70	36.6	12.8	3.2
30	34.6	9.6	2.9	80	36.0	12.3	5.1
40	35.2	10.4	2.8	90	35.9	12.4	7.0
50	35.8	11.1	2.8	100	35.6	12.6	8.8

## SOLUBILITY OF SODIUM CHLORIDE IN AQUEOUS SOLUTIONS OF SODIUM BICARBONATE SATURATED WITH CO<sub>2</sub>.

(Fedotieff.)

t°.	Wt. of 1 cc. Solution.	Mols. per 1000 Gms. H <sub>2</sub> O.		Grams per 1000 Gms. H <sub>2</sub> O.	
		NaHCO <sub>3</sub> .	NaCl.	NaHCO <sub>3</sub> .	NaCl.
0	...	0.0	6.09	0.0	356.3
"	1.208	0.09	6.0	7.7	350.1
15	1.203	0.0	6.12	0.0	357.6
"	1.203	0.12	6.06	10.0	354.6
30	1.196	0.0	6.16	0.0	360.3
"	1.199	0.17	6.12	13.9	358.1
45	1.189	0.0	6.24	0.0	356.0
"	1.198	0.23	6.18	0.23	361.5

# SOLUBILITY OF SODIUM CHLORIDE IN AQUEOUS SODIUM HYDROXIDE SOLUTIONS.

(Engel; Winteler — Z. Electrochem. 7, 360, '00.)

At 0° (Engel).

At 20° (Winteler).

Mg. Mols. per 10 cc.		Sp. Gr. of Solutions.	Grams per Liter.		Gms. per Liter		Sp. Gr. of Solutions.
Na <sub>2</sub> O.	NaCl.		NaOH.	NaCl.	NaOH.	NaCl.	
0	54.7	1.207	0.0	320.0	10	308	1.200
4.8	49.38	1.221	38.4	288.9	50	297	1.230
6.73	47.21	1.225	53.8	276.2	100	253	1.250
10.41	42.38	1.236	183.2	247.9	150	213	1.270
14.78	39.55	1.249	118.2	231.4	200	139	1.305
30.50	24.95	1.295	244.0	146.0	300	112	1.330
37.88	19.30	1.314	303.0	112.9	400	61	1.375
53.25	9.41	1.362	426.0	55.0	500	30	1.425
					640	18	1.490

# SOLUBILITY OF SODIUM CHLORIDE IN AQUEOUS SOLUTIONS OF SODIUM NITRATE AND VICE VERSA.

(Bodländer — Z. physik. Ch. 7, 361, '91; Nicol — Phil. Mag. [5] 31, 369, '91; results at 25° by Soch — J. Physic. Ch. 2, 46, '98.)

NaCl in Aqueous NaNO<sub>3</sub>.  
Results at 15.5° (B.).NaNO<sub>3</sub> in Aqueous NaCl.  
Results at 15° (B.).

Sp. Gr. of Solutions.	Gms. per 100 cc. Sat. Solution.			Sp. Gr. of Solutions.	Gms. per 100 cc. Sat. Solution.		
	NaNO <sub>3</sub> .	H <sub>2</sub> O.	NaCl.		NaCl.	H <sub>2</sub> O.	NaNO <sub>3</sub> .
1.2025	0	88.47	31.78	1.3720	0	74.82	62.38
1.2305	7.53	87.63	27.89	1.3645	4.0	75.69	56.76
1.2580	13.24	86.25	26.31	1.3585	7.24	75.71	52.09
1.2810	21.58	82.66	23.98	1.3530	11.36	76.86	47.08
1.3090	28.18	80.42	22.30	1.3495	15.33	76.96	42.66
1.3345	33.80	79.25	20.40	1.3485	17.81	77.14	39.90
1.3465	37.88*	77.37	19.40*	1.3485	18.97*	77.15	38.73*
1.3465	37.64*	77.34	19.67*	1.3485	19.34*	77.49	38.02*

Results at 20° (N.).

Grams per 100 Grams H <sub>2</sub> O.				Grams per 100 Grams H <sub>2</sub> O.			
0	NaNO <sub>3</sub>	35.91	NaCl	0	NaCl	87.65	NaNO <sub>3</sub>
14.17	"	32.82	"	6.5	"	77.34	"
28.33	"	29.78	"	13.0	"	68.50	"
42.50	"	26.91	"	19.5	"	60.49	"
54.63*	"	24.92*	"				

100 gms. H<sub>2</sub>O dissolve 43.66\* gms. NaNO<sub>3</sub> + 26.58\* gms. NaCl at 25°.100 gms. H<sub>2</sub>O dissolve 121.6\* gms. NaNO<sub>3</sub> + 17.62\* gms. NaCl at 80°.100 gms. aq. alcohol of 40 wt. per cent dissolve 22.78 gms. NaNO<sub>3</sub> + 10.17 gms. NaCl at 25°.

\* Indicates solutions saturated with both salts.



# **SOLUBILITY OF SODIUM CHLORIDE IN AQUEOUS SOLUTIONS OF**

**SODIUM BICARBONATE SATURATED WITH CO<sub>2</sub>**

Temp.	Wt. of sat. solution	Mols. per 1000 Gms. H <sub>2</sub> O.	Grams per 10000 Gms. H <sub>2</sub> O.	
			NaHCO <sub>3</sub>	NaCl
0	1.208	0.09	356.3	350.1
10	1.203	0.09	357.6	354.6
20	1.203	0.09	357.6	354.6
30	1.196	0.09	357.6	354.6
40	1.187	0.09	357.6	354.6
50	1.178	0.09	357.6	354.6
60	1.169	0.09	357.6	354.6
70	1.160	0.09	357.6	354.6
80	1.151	0.09	357.6	354.6
90	1.142	0.09	357.6	354.6
100	1.133	0.09	357.6	354.6

**SOLUBILITY OF SODIUM CHLORIDE IN AQUEOUS SOLUTIONS OF OTHER**

Temp.	Wt. of sat. solution	Mols. per 1000 Gms. H <sub>2</sub> O.	Grams per 10000 Gms. H <sub>2</sub> O.	
			NaHCO <sub>3</sub>	NaCl
0	1.208	0.09	356.3	350.1
10	1.203	0.09	357.6	354.6
20	1.203	0.09	357.6	354.6
30	1.196	0.09	357.6	354.6
40	1.187	0.09	357.6	354.6
50	1.178	0.09	357.6	354.6
60	1.169	0.09	357.6	354.6
70	1.160	0.09	357.6	354.6
80	1.151	0.09	357.6	354.6
90	1.142	0.09	357.6	354.6
100	1.133	0.09	357.6	354.6

**SOLUBILITY OF SODIUM CHLORIDE IN AQUEOUS SOLUTIONS OF POTASSIUM**

Temp.	Wt. of sat. solution	Mols. per 1000 Gms. H <sub>2</sub> O.	Grams per 10000 Gms. H <sub>2</sub> O.	
			NaHCO <sub>3</sub>	NaCl
0	1.208	0.09	356.3	350.1
10	1.203	0.09	357.6	354.6
20	1.203	0.09	357.6	354.6
30	1.196	0.09	357.6	354.6
40	1.187	0.09	357.6	354.6
50	1.178	0.09	357.6	354.6
60	1.169	0.09	357.6	354.6
70	1.160	0.09	357.6	354.6
80	1.151	0.09	357.6	354.6
90	1.142	0.09	357.6	354.6
100	1.133	0.09	357.6	354.6

**SOLUBILITY OF SODIUM CHLORIDE IN AQUEOUS SOLUTIONS OF**

**SODIUM BICARBONATE SATURATED WITH CO<sub>2</sub>**

(Feldsiff.)

Temp.	Wt. of sat. solution	Mols. per 1000 Gms. H <sub>2</sub> O.		Grams per 10000 Gms. H <sub>2</sub> O.	
		NaHCO <sub>3</sub>	NaCl	NaHCO <sub>3</sub>	NaCl
0	1.208	0.09	6.09	356.3	350.1
10	1.203	0.09	6.09	357.6	354.6
15	1.203	0.09	6.09	357.6	354.6
30	1.196	0.09	6.09	357.6	354.6
45	1.187	0.09	6.09	357.6	354.6
60	1.178	0.09	6.09	357.6	354.6
75	1.169	0.09	6.09	357.6	354.6
90	1.160	0.09	6.09	357.6	354.6
100	1.151	0.09	6.09	357.6	354.6

**SODIUM CHLORIDE****SOLUBILITY OF SODIUM CHLORIDE IN AQUEOUS SOLUTIONS OF VARIOUS SUBSTANCES**

Engel-Winkel—2. Engelman, 7, 10, 11

At 0° (Engel).

At 21° (Vintner).

Mo. Mole per 100 g.	Sp. Gr. of Solution.	Grams per Liter	Grams per Liter	Sp. Gr. of Solution.	
NaCl	NaCl	NaCl	NaCl	NaCl	
0	54.7	1.207	0.0	322.0	1.200
4.8	46.35	1.221	38.4	258.0	1.232
6.73	47.21	1.225	53.8	272.0	1.240
11.41	48.35	1.236	183.2	247.0	1.250
14.75	50.55	1.249	118.2	231.4	1.250
22.55	52.95	1.295	244.0	140.0	1.330
31.55	54.75	1.324	303.0	112.0	1.375
55.55	1.00	1.350	426.0	55.0	1.425
				0.40	1.400

**SOLUBILITY OF SODIUM CHLORIDE IN AQUEOUS SOLUTIONS OF VARIOUS SUBSTANCES AND VICE VERSA.**

Engel-Winkel—1. Engel-Winkel, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.

Results at 0°.

**NaNO<sub>3</sub> in Aqueous NaCl**  
Results at 15° (B.).

Mo. Mole per 100 g.	Sp. Gr. of Solution.	Grams per Liter	Grams per Liter	Sp. Gr. of Solution.	
NaCl	NaCl	NaCl	NaCl	NaCl	
0	54.7	1.207	0.0	322.0	1.200
4.8	40.35	1.221	38.4	258.0	1.232
6.73	47.21	1.225	53.8	272.0	1.240
11.41	48.35	1.236	183.2	247.0	1.250
14.75	50.55	1.249	118.2	231.4	1.250
22.55	52.95	1.295	244.0	140.0	1.330
31.55	54.75	1.324	303.0	112.0	1.375
55.55	1.00	1.350	426.0	55.0	1.425
				0.40	1.400

1048, '01.)

# SODIUM CHLORIDE

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## SOLUBILITY OF SODIUM CHLORIDE IN ALCOHOLS.

(At 18.5°, de Bruyn — Z. physik. Ch. 10, 782, '92; Rohland — Z. anorg. Ch. 18, 327, '98.)

t°.	Alcohol.	Gms. NaCl per 100 Gms. Alcohol.	t°.	Alcohol	Gms. NaCl per 100 Gms. Alcohol.
18.5	Abs. Methyl	1.41	room temp.	Methyl $d_{15}$	=0.799 1.33
"	" Ethyl	0.065	"	Ethyl $d_{15}$	=0.81 0.176
			"	Propyl $d_{15}$	=0.816 0.033

## SOLUBILITY OF SODIUM CHLORIDE IN AQUEOUS ETHYL ALCOHOL SOLUTIONS.

(Bodländer — Z. physik. Ch. 7, 317, '91; Taylor — J. Phys. Ch. 1, 723, '97; also Bathrick — *Ibid.* 1, 159, '96.)

Results at 11.5° (B.).				Results at 13° (B.).			
Sp. Gr. of Solutions.	Gms. per 100 cc. Solution.			Sp. Gr. of Solutions.	Gms. per 100 cc. Solution.		
	C <sub>2</sub> H <sub>5</sub> OH.	H <sub>2</sub> O.	NaCl.		C <sub>2</sub> H <sub>5</sub> OH.	H <sub>2</sub> O.	NaCl.
1.2035	0	86.62	31.73	1.2030	0	88.70	31.60
1.1865	2.86	86.14	29.66	1.1348	11.81	78.41	23.26
1.1710	5.41	83.93	27.77	1.1144	15.99	74.64	20.81
1.1548	7.93	81.50	26.05	1.0970	19.39	71.45	18.86
1.1350	10.84	78.78	24.28	1.0698	24.95	69.80	16.23
1.1390	11.22	78.62	23.65	1.0295	32.33	57.96	12.66
1.1088	16.85	73.40	20.63	0.9880	40.33	49.34	9.13
				0.9445	49.28	38.54	5.93
				0.9075	57.91	29.37	3.47
				0.8700	63.86	21.62	1.52
				0.8400	72.26	11.24	0.50

## Results at 30° and at 40° (T.).

Wt. per cent Alcohol in Solvent.	At 30°. Gms. NaCl per 100 Gms.		At 40°. Gms. NaCl per 100 Gms.	
	Solution.	Water.	Solution.	Water.
0	26.50	36.05	26.68	36.38
5	24.59	34.29	24.79	34.69
10	22.66	32.57	22.90	33.00
20	19.05	29.40	19.46	30.20
30	15.67	26.53	16.02	27.25
40	12.45	23.70	12.75	24.37
50	9.34	20.60	9.67	21.42
60	6.36	16.96	6.65	17.82
70	3.36	12.75	3.87	13.10
80	1.56	7.95	1.69	8.68
90	0.43	4.30	0.50	5.10

100 gms. alcohol of 0.9282 Sp. Gr. = 54.0% by wt. dissolve at:

4°	10°	13°	23°	32°	33°	44°	51°	60°
10.9	11.1	11.43	11.9	12.3	12.5	13.1	13.8	14.1 gms. NaCl

(Gerardin — Ann. chim. phys. [4] 5, 146, '56.)

100 gms. of a mixture of equal parts of 96% alcohol and 98% ether dissolve 0.11 gm. NaCl.

(Mayer — Liebig's Ann. 98, 205, '56.)

## SOLUBILITY OF SODIUM CHLORIDE IN AQUEOUS SOLUTIONS OF:

Acetone at 20°.

(Herz and Knoch — Z. anorg. Ch. 42, 318, '04.)

cc. Acetone per 100 cc. Solvent.	NaCl per 100 cc. Solution.	
	Millimols.	Grams.
0	537.9	31.47
10	464.6	27.18
20	394.8	23.10
30	330.1	19.32
32 } Lower layer	308.5	18.05
87 } Upper layer	7.7	0.45
88	7.3	0.43
90	4.3	0.25

Glycerine at 25°.

(H. and K. — *Ibid.* 45, 267, '05.)

Wt. per cent Glycerine in Solvent.	NaCl per 100 cc. Solution.		Sp. Gr. of Solution.
	Millimols.	Grams.	
0.0	545.6	31.93	1.1960
13.28	501.1	29.31	1.2048
25.98	448.4	26.23	1.2133
45.36	370.2	21.66	1.2283
54.23	333.9	19.54	1.2381
83.84	220.8	12.91	1.2666
100.00*	167.1	9.78	1.2964

\*Sp. Gr. of Glycerine, 1.2592.  
Impurities about 1.5%.

100 gms. sat. solution in glycol contain 31.7 gms. NaCl at 14.8°.

(de Coninck — Chem. Centralb. 76, II, 883, '05.)

100 gms. H<sub>2</sub>O dissolve 236.3 gms. sugar + 42.3 gms. NaCl at 31.25°,  
or 100 gms. sat. aq. solution contain 62.17 gms. sugar + 11.13 gms.  
NaCl.

(Köhler — Z. Ver. Zuckerind. 47, 447, '97.)

## SODIUM CHROMATES (Mono, Di, etc.)

## SOLUBILITY IN WATER.

(Mylus and Funk — Wiss. Abh. p. t. Reichsanstalt 3, 451, '00; see also Salkowski — Ber. 34, 1048, '01.)

## Sodium Mono Chromate.

t°.	Gms. Na <sub>2</sub> CrO <sub>4</sub> per 100 Gms. Solution.	Mols. Na <sub>2</sub> CrO <sub>4</sub> per 100 Mols. H <sub>2</sub> O.	Solid Phase.
0	24.07	3.52	Na <sub>2</sub> CrO <sub>4</sub> ·10H <sub>2</sub> O
10	33.41	5.55	"
18*	40.10	7.43	"
18.5	41.65	7.94	"
19.5	44.78	9.01	"
21	47.40	10.00	"
25.6	46.08	9.52	Na <sub>2</sub> CrO <sub>4</sub> ·4H <sub>2</sub> O
31.5	47.05	9.90	"
36	47.98	10.2	"
40	48.97	10.6	"
45	50.20	11.6	"
49.5	50.93	11.5	"
54.5	52.28	12.2	"
59.5	53.39	12.7	"
65	55.23	13.7	Na <sub>2</sub> CrO <sub>4</sub>
70	55.15	13.6	"
80	55.53	13.8	"
100	55.74	14.0	"

## Sodium Di Chromate.

t°.	Gms. Na <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> per 100 Gms. Solution.	Mols. Na <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> per 100 Mols. H <sub>2</sub> O.	Solid Phase.
0	61.98	11.2	Na <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> ·2H <sub>2</sub> O
10	63.82	12.1	"
18†	63.92	12.16	"
34.5	67.36	14.2	"
52	71.76	17.4	"
72	76.9	22.8	"
81	79.8	27.1	"
93	81.19	29.6	Na <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub>
98	81.25	29.8	"

## Sodium Tri Chromate.

t°.	Gms. Na <sub>2</sub> Cr <sub>3</sub> O <sub>10</sub> per 100 Gms. Solution.	Mols. Na <sub>2</sub> Cr <sub>3</sub> O <sub>10</sub> per 100 Mols. H <sub>2</sub> O.	Solid Phase.
0	80.03	19.9	Na <sub>2</sub> Cr <sub>3</sub> O <sub>10</sub> ·H <sub>2</sub> O.
15†	80.44	20.4	"
18	80.60	20.56	"
55	82.68	23.7	"
99	85.78	29.9	"

\*Sp. Gr. of sat. sol. at 18° = 1.432. †Sp. Gr. of sat. sol. at 18° = 2.059.

‡Sp. Gr. of sat. solution at 18° = 1.745.

# SODIUM CHROMATES

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Sodium Tetra Chromate.				Tetra Sodium Chromate.			
t°.	Gms. Na <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> per 100 Gms. Solution.	Mols. Na <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> per 100 Mols. H <sub>2</sub> O.	Solid Phase.	t°.	Gms. Na <sub>2</sub> CrO <sub>3</sub> per 100 Gms. Solution.	Mols. Na <sub>2</sub> CrO <sub>3</sub> per 100 Mols. H <sub>2</sub> O.	Solid Phase.
0	72.96	10.5	Na <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> ·4H <sub>2</sub> O	0	33.87	4.11	Na <sub>2</sub> CrO <sub>3</sub> ·13H <sub>2</sub> O
16	74.19	11.2	"	10	35.58	4.42	"
18*	74.60	11.27	"	18†	37.50	4.81	"
22	76.01	12.3	"	27.7	40.09	5.38	"
				37	45.13	6.62	"

\* Sp. Gr. of sat. solution at 18° = 1.926.

† Sp. Gr. of sat. solution at 18° = 1.446.

## SOLUBILITY OF SODIUM CHROMATES IN WATER AT 30°.

(Schreinemaker — Z. physik. Ch. 55, 91, '06.)

Composition in weight per cent:

Of Solution.		Of Residue.		Solid Phase.
%CrO <sub>3</sub> .	%Na <sub>2</sub> O.	%CrO <sub>3</sub> .	%Na <sub>2</sub> O.	
0	± 42	...	...	NaOH.H <sub>2</sub> O
2.00	41.44	5.83	42.64	NaOH.H <sub>2</sub> O + Na <sub>2</sub> CrO <sub>4</sub>
2.04	40.89	...	...	Na <sub>2</sub> CrO <sub>4</sub>
4.23	35.51	27.52	36.57	"
6.64	32.34	27.72	34.60	"
15.19	27.06	37.07	32.20	"
10.22	29.39	15.48	28.41	Na <sub>2</sub> CrO <sub>4</sub> + Na <sub>2</sub> CrO <sub>3</sub> ·13H <sub>2</sub> O
8.93	28.49	18.09	26.89	Na <sub>2</sub> CrO <sub>3</sub> ·13H <sub>2</sub> O
8.62	26.91	...	...	"
13.12	23.91	18.57	25.92	"
18.44	22.86	...	...	"
19.26	22.98	21.54	25.31	Na <sub>2</sub> CrO <sub>3</sub> ·13H <sub>2</sub> O + Na <sub>2</sub> CrO <sub>4</sub> ·4H <sub>2</sub> O
17.84	24.21	26.24	24.98	Na <sub>2</sub> CrO <sub>4</sub> ·4H <sub>2</sub> O
28.82	17.88	31.97	23.47	"
38.93	16.30	40.70	20.83	"
48.70	16.49	47.49	19.75	Na <sub>2</sub> CrO <sub>4</sub> ·4H <sub>2</sub> O + Na <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> ·2H <sub>2</sub> O
50.68	15.72	...	...	Na <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> ·2H <sub>2</sub> O
58.08	13.89	62.76	17.38	"
66.13	13.70	69.48	16.06	Na <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> ·2H <sub>2</sub> O + Na <sub>2</sub> Cr <sub>2</sub> O <sub>10</sub> .H <sub>2</sub> O
65.98	14.15	69.46	15.15	Na <sub>2</sub> Cr <sub>2</sub> O <sub>10</sub> .H <sub>2</sub> O
68.46	10.95	73.88	13.38	Na <sub>2</sub> Cr <sub>2</sub> O <sub>10</sub> .H <sub>2</sub> O + Na <sub>2</sub> Cr <sub>2</sub> O <sub>13</sub> ·4H <sub>2</sub> O
66.88	9.85	71.27	10.67	Na <sub>2</sub> Cr <sub>2</sub> O <sub>13</sub> ·4H <sub>2</sub> O
70.06	11.85	83.95	9.57	" (?)
69.04	11.04	81.80	6.43	CrO <sub>3</sub>
67.84	9.81	82.85	5.42	"
64.48	4.51	79.49	2.71	"
62.28	0.0	100.00	...	"

100 gms. of a saturated aqueous solution contain at 30°:

46.627 gms. Na<sub>2</sub>CrO<sub>4</sub>, or 100 gms. H<sub>2</sub>O dissolve 87.36 gms. Na<sub>2</sub>CrO<sub>4</sub>.

66.4 gms. Na<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>, or 100 gms. H<sub>2</sub>O dissolve 197.6 gms. Na<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>.

100 gms. absolute methyl alcohol dissolve 0.345 gm. Na<sub>2</sub>CrO<sub>4</sub> at 25°.

(de Bruyn — Z. physik. Ch. 10, 783, '92.)

**SODIUM CITRATE**  $2C_6H_4(OH)(COONa)_{3.11}H_2O$ .

100 gms.  $H_2O$  dissolve 90.9 gms. citrate at  $25^\circ$ , and 250 gms. at b. pt.  
(U.S.P.)

**SODIUM (Ferro) CYANIDE**  $Na_4Fe(CN)_6$ .

## SOLUBILITY IN WATER.

(Conroy — J. Soc. Chem. Ind. 17, 104, '98.)

$t^\circ$	$20^\circ$	$42^\circ$	$80^\circ$	$98.5^\circ$
Gms. $Na_4Fe(CN)_6$ per 100 gms. $H_2O$	17.9	30.2	59.2	63.0

**SODIUM FORMATE**  $HCOONa$ . SOLUBILITY IN WATER.

(Groschuff — Ber. 36, 1788, '03.)

$t^\circ$	Gms. $HCOONa$ per 100 Gms. Solution.	Mols. $HCOONa$ per 100 Mols. $H_2O$ .	Solid Phase.	$t^\circ$	Gms. $HCOONa$ per 100 Gms. Solution.	Mols. $HCOONa$ per 100 Mols. $H_2O$ .	Solid Phase.
-20	22.80	7.82	$HCOONa \cdot 3H_2O$	25.5	50.53	27.0	$HCOONa \cdot 2H_2O$
0	30.47	11.6	"	18	49.22	25.65	$HCOONa$
+15	41.88	19.1	"	29	50.44	26.9	"
18	44.92	21.6	"	54	53.80	30.8	"
18	44.73	21.4	$HCOONa \cdot 2H_2O$	74.5	56.82	34.8	"
21	46.86	23.3	"	100.5	61.54	42.35	"
23	48.22	24.65	"	123	66.20	51.8	"

Sp. Gr. of the saturated solution of the dihydrate at  $18^\circ = 1.317$ .

## SOLUBILITY OF SODIUM ACID FORMATE (EXPRESSED AS NEUTRAL SALT) IN AQUEOUS SOLUTIONS OF FORMIC ACID.

(Groschuff.)

$t^\circ$	Gms. $HCOONa$ per 100 Gms. Solution.	Mols. $HCOONa$ per 100 Mols. $H_2O$ .	Solid Phase.	$t^\circ$	Gms. $HCOONa$ per 100 Gms. Solution.	Mols. $HCOONa$ per 100 Mols. $H_2O$ .	Solid Phase.
0	22.35	19.5	$HCOONa \cdot HCOOH$	45.5	38.85	43.1	$HCOONa$
25.5	29.62	28.45	"	70	41.27	47.5	"
66.5	41.08	47.1	"	85	43.09	51.2	"

**SODIUM FLUORIDE**  $NaF$ .

100 gms. sat. aq. solution contain 4.3 gms.  $NaF$  at  $18^\circ$ . Sp. Gr. of solution = 1.044.  
(Mylius and Funk — Ber. 30, 1718, '97.)

SOLUBILITY OF SODIUM FLUORIDE IN AQUEOUS SOLUTIONS OF HYDROFLUORIC ACID AT  $21^\circ$ .

(Ditte — Compt. rend. 123, 1282, '96.)

Grams per 1000 Grams $H_2O$ .		Grams per 1000 Grams $H_2O$ .	
0.0 HF	41.7 NaF	83.8 HF	22.9 NaF
10.0 "	41.4 "	129.7 "	23.8 "
45.8 "	22.5 "	596.4 "	48.8 "
56.5 "	22.7 "	777.4 "	81.7 "

**SODIUM FLUO SILICATE**  $Na_2SiF_6$ .

100 gms.  $H_2O$  dissolve 0.65 gm. at  $17.5^\circ$ , and 2.45 gms. at  $100^\circ$ .  
(Stolba — Z. anal. Ch. 11, 199, '79.)

## SODIUM HYDROXIDE

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### SODIUM HYDROXIDE NaOH.

#### SOLUBILITY IN WATER.

(Pickering — J. Ch. Soc. 63, 890, '93; Mylius and Funk (Diets) — Wiss. Abb. p. t. Reichenstalt 3, 450, '00.)

t°.	Gms. NaOH per 100 Gms.		Solid Phase.	t°.	Gms. NaOH per 100 Gms.		Solid Phase.
	Solution.	Water.			Solution.	Water.	
- 7.8	8.0	8.7	Ice	20	52.2	109	NaOH.H <sub>2</sub> O
-20	16.0	19.1	"	30	54.3	119	"
-28	19.0	23.5	Ice + NaOH.7H <sub>2</sub> O	40	56.3	129	"
-24	22.2	28.5	NaOH.7H <sub>2</sub> O + NaOH.5H <sub>2</sub> O	50	59.2	145	"
-17.7	24.5	32.5	NaOH.5H <sub>2</sub> O + NaOH.4H <sub>2</sub> O	60	63.5	174	"
0	29.6	42.0	NaOH.4H <sub>2</sub> O	64.3	69.0	222.3	" f. pt.
+ 5	32.2	47.5	NaOH.4H <sub>2</sub> O + NaOH.3½H <sub>2</sub> O	61.8	74.2	288	NaOH.H <sub>2</sub> O + NaOH
10	34.0	51.5	NaOH.3½H <sub>2</sub> O	80	75.8	313	NaOH (?)
15.5	38.9	63.53	" f. pt.	110	78.5	365	"
5	45.5	83.5	NaOH.3½H <sub>2</sub> O + NaOH.2H <sub>2</sub> O	192	83.9	521	"
12	50.7	103.0	NaOH.2H <sub>2</sub> O + NaOH.H <sub>2</sub> O				

Sp. Gr. of sat. solution at 18° = 1.539.

For determinations of the Sp. Gr. of sodium hydroxide solution, see Kohlrausch — Wied. Ann. 1, 1879; Wegscheider and Waller — Monatsh. Chem. 28, 685, '05.

### SODIUM IODATE NaIO<sub>3</sub>.

#### SOLUBILITY IN WATER.

(Gay-Lussac; Kremers — Pogg. Ann. 97, 5, '56.)

Gms. NaIO <sub>3</sub> per 100 gms. H <sub>2</sub> O	t°.	0°.	20°.	40°.	60°.	80°.	100°.
		2.5	9	15	21	27	34

### SODIUM IODIDE NaI.2H<sub>2</sub>O.

#### SOLUBILITY IN WATER.

(de Copper — Ann. chim. phys. [5] 30, 411, '83; see also Etard — Compt. rend. 98, 1434, '84; and Kremers — Pogg. Ann. 97, 14, '56.)

t°.	Grams NaI per 100 Gms.		Solid Phase.	t°.	Grams NaI per 100 Gms.		Solid Phase.
	Water.	Solution.			Water.	Solution.	
-20	148.0	59.7	NaI.2H <sub>2</sub> O	60	256.8	72.0	NaI.2H <sub>2</sub> O
0	158.7	61.4	"	65	278.4	73.6	"
10	168.6	62.8	"	67	293	74.6	NaI
20	178.7	64.1	"	70	294	74.6	"
25	184.2	64.8	"	80	296	74.7	"
30	190.3	65.6	"	100	302	75.1	"
40	205.0	67.2	"	120	310	75.6	"
50	227.8	69.5	"	140	321	76.3	"

#### SOLUBILITY OF SODIUM IODIDE IN SEVERAL SOLVENTS.

(At 22.5°, de Bruyn — Z. physik. Ch. 10, 783, '92; at ord. temp., Rohland — Z. anorg. Ch. 18, 327, '98; Walden — Z. physik. Ch. 55, 713, 718, '06.)

Solvent.	t°.	Gms. NaI per 100 Gms. Solvent.	Solvent.	Gms. NaI per 100 Gms. Solution.	
				at 0°.	at 25°.
Absolute Ethyl Alcohol	22.5	43.1	Acetonitril	22.09	18.43
d <sub>15</sub> 0.810 Ethyl Alcohol	ord. temp.	58.8	Propionitril	9.09	6.23
Absolute Methyl Alcohol	22.5	77.7	Nitro Methane	0.34	0.48
d <sub>15</sub> 0.799 Methyl Alcohol	ord. temp.	83.3	Acetone	very soluble	
d <sub>15</sub> 0.816 Propyl Alcohol	ord. temp.	26.3	Furfural	...	25.10

**SODIUM MOLYBDATE**  $\text{Na}_2\text{MoO}_4$ .**SOLUBILITY IN WATER.**

(Funk — Ber. 33, 3697, '00.)

t°.	Gms. $\text{Na}_2\text{MoO}_4$ per 100 Gms. Solution.	Mols. $\text{Na}_2\text{MoO}_4$ per 100 Mols. $\text{H}_2\text{O}$ .	Solid Phase.	t°.	Gms. $\text{Na}_2\text{MoO}_4$ per 100 Gms. Solution.	Mols. $\text{Na}_2\text{MoO}_4$ per 100 Mols. $\text{H}_2\text{O}$ .	Solid Phase.
0	30.63	3.86	$\text{Na}_2\text{MoO}_4 \cdot 10\text{H}_2\text{O}$	15.5	39.27	5.65	$\text{Na}_2\text{MoO}_4 \cdot 2\text{H}_2\text{O}$
4	33.83	4.47	"	18	39.40	5.70	"
6	35.58	4.83	"	32	39.82	5.78	"
9	38.16	5.39	"	51.5	41.27	6.14	"
10	39.28	5.65	$\text{Na}_2\text{MoO}_4 \cdot 2\text{H}_2\text{O}$	100	45.57	7.32	"

100 gms.  $\text{H}_2\text{O}$  dissolve 3.878 gms. sodium tri molybdate  $\text{Na}_2\text{Mo}_3\text{O}_{10}$  at 20°, and 13.7 gms. at 100°.

(Ullik — Liebig's Ann. 144, 244, '67.)

**SODIUM NITRATE**  $\text{NaNO}_3$ .**SOLUBILITY IN WATER.**

(Mulder; Berkeley — Trans. Roy. Soc. (Lond.) 203 A, 211, '04; see also Ditte — Compt. rend. 80, 1164, '75; Maumee — *Ibid.* 58, 81, '64; Etard — Ann. chim. phys. [7] 2, 527, '94.)

t°.	Gms. $\text{NaNO}_3$ per 100 Gms. Solution.	Gms. Water.	Mols. per Liter.	t°.	Gms. $\text{NaNO}_3$ per 100 Gms. Solution.	Gms. Water.	Mols. per Liter.
0	42.2	72.9—73.0*	6.71*	80	59.7	148.0—148.0*	10.35*
10	44.7	80.8—80.5	7.16	100	64.3	180.0—175.8	11.30
20	46.7	87.5—88.0	7.60	120	68.6	218.0—208.8†	12.22†
25	47.6	91.0—92.0	7.80	180	78.1	356.7	
30	48.7	94.9—96.2	8.06	220	83.5	506.0	
40	50.5	102.0—104.9	8.51	225	91.5	1076.0	
50	52.8	112.0—114.0	8.97	313 m.pt.	100.0	∞	
60	54.9	122.0—124.0	9.42	...			

\* Berkeley.

† 119°.

**SOLUBILITY OF SODIUM NITRATE IN AQUEOUS SOLUTIONS OF NITRIC ACID AT 0°.**

(Engel — Compt. rend. 104, 911, '87; see also Schultz — Zeit. Ch. [2] 5, 531, '62.)

Equivalents per 10 cc. Solution.		Sp. Gr. of Solutions.	Grams per 100 cc. Solution.	
$\text{NaNO}_3$ .	$\text{HNO}_3$ .		$\text{NaNO}_3$ .	$\text{HNO}_3$ .
66.4	0	1.341	56.5	0.00
63.7	2.65	1.338	54.2	1.67
60.5	5.7	1.331	51.48	3.59
56.9	8.8	1.324	48.42	5.55
52.75	12.57	1.312	44.88	7.92
48.7	16.9	1.308	41.44	10.65
39.5	27.0	1.291	33.61	17.02
35.1	32.25	1.285	29.86	20.33
31.1	37.25	1.282	26.46	23.48
23.5	48.0	1.276	20.0	30.26
18.0	57.25	1.276	15.32	36.09
12.9	71.0	1.291	10.97	44.76



## SOLUBILITY OF MIXTURES OF SODIUM NITRATE AND POTASSIUM NITRATE IN WATER AT 20°.

(Carnelly and Thomson — J. Ch. Soc. 53, 799, '88.)

Per cent NaNO <sub>3</sub> in Mixtures Used.	Gms. per 100 Gms. H <sub>2</sub> O.		Per cent NaNO <sub>3</sub> in Mixtures Used.	Gms. per 100 Gms. H <sub>2</sub> O.	
	NaNO <sub>3</sub> .	KNO <sub>3</sub> .		NaNO <sub>3</sub> .	KNO <sub>3</sub> .
100	86.8	0	45.7	53.3	34.7
90	96.4	13.2	40	45.6	35.5
80	98.0	38.5	20	20.8	33.3
60	90.0	47.6	10	9.4	31.5
50	66.0	40.0	0	0.0	33.6

100 gms. H<sub>2</sub>O dissolve 24.9 gms. NaCl + 53.6 gms. NaNO<sub>3</sub> at 20°.

(Rüdorff — Ber. 6, 484, '73; Karsten; Nicol — Phil. Mag. [5] 31, 386, '91.)

## SOLUBILITY OF SODIUM NITRATE IN AQUEOUS SOLUTIONS OF SODIUM HYDROXIDE AT 0°.

(Engel — Bull. soc. chim. [3] 6, 16, '91.)

Milligram Mols. per 10 cc. Solution.		Sp. Gr. of Solutions.	Grams per 100 cc. Solution.	
Na <sub>2</sub> O.	NaNO <sub>3</sub> .		NaOH.	NaNO <sub>3</sub> .
0.0	66.4	1.341	0.0	56.50
2.875	62.5	1.338	2.30	53.19
6.1	57.15	1.333	4.89	48.63
12.75	47.5	1.327	10.21	40.42
26.0	29.5	1.326	20.83	25.10
39.0	17.5	1.332	31.25	14.89
45.88	13.19	1.356	36.76	11.22
60.88	6.05	1.401	48.75	5.15

## SOLUBILITY OF SODIUM NITRATE IN ALCOHOLS.

100 gms. abs. methyl alcohol dissolve 0.41 gm. NaNO<sub>3</sub> at 25°.100 gms. abs. ethyl alcohol dissolve 0.036 gm. NaNO<sub>3</sub> at 25°.

(de Bruyn — Z. physik. Ch. 10, 783, '92.)

## SOLUBILITY OF SODIUM NITRATE IN AQUEOUS ETHYL ALCOHOL AT DIFFERENT TEMPERATURES.

(Bodländer — Z. physik. Ch. 7, 317, '91; Taylor — J. Physic. Ch. 1, 723, '97; Bathrick — *Ibid.* 1, 162, '96.)

## Results at 13° (B.).

Sp. Gr. of Solutions.	Gms. per 100 cc. Solution.		
	C <sub>2</sub> H <sub>5</sub> OH.	H <sub>2</sub> O.	NaNO <sub>3</sub> .
1.3700	0.0	75.34	61.66
1.3395	3.08	73.53	57.34
1.3120	6.01	71.81	53.39
1.2845	8.30	70.85	49.30
1.2580	10.91	69.47	45.42
1.2325	13.77	67.12	42.36
1.2010	16.46	66.16	37.48

## Results at 16.5° (B.).

Sp. Gr. of Solutions.	Gms. per 100 cc. Solution.		
	C <sub>2</sub> H <sub>5</sub> OH.	H <sub>2</sub> O.	NaNO <sub>3</sub> .
1.3745	0.0	75.25	62.20
1.3162	6.16	70.82	54.64
1.2576	11.60	68.10	46.06
1.2140	16.49	65.04	39.87
1.1615	22.17	61.67	32.31
1.0855	32.22	52.92	23.41
1.0558	37.23	48.50	19.85
1.0050	43.98	42.78	13.74
0.9420	52.60	32.13	9.47
0.9030	60.00	25.65	4.65
0.8610	63.16	21.31	1.63

**SODIUM NITRATE****Results at 30° (T.).**

Wt. per cent Alcohol in Solvent.	Gms. NaNO <sub>3</sub> per 100 Gms.	
	Solution.	Water.
0	49.10	96.45
5	46.41	91.15
10	43.50	85.55
20	37.42	74.75
30	31.31	65.10
40	25.14	55.95
50	18.94	46.75
60	12.97	37.25
70	7.81	28.25
90	1.21	12.25

**Results at 40°.**

(Bathrick.)

Wt. per cent Alcohol.	Gms. NaNO <sub>3</sub> per 100 Gms. Aq. Alcohol.
0	104.5
8.22	90.8
17.4	73.3
26.0	61.6
36.0	48.4
42.8	40.6
55.3	27.1
65.1	18.1
77.0	9.4
87.2	4.2

**SOLUBILITY OF SODIUM NITRATE IN AQUEOUS SOLUTIONS OF ACETONE.****Results at 30°.**

(Taylor.)

Wt. per cent Acetone in Solvent.	Gms. NaNO <sub>3</sub> per 100 Gms.	
	Solution.	Water.
0	49.10	96.45
5	46.96	93.20
9.09	45.11	90.40
20	40.10	83.70
30	35.08	77.20
40	29.80	70.75
50	24.34	64.40
60	18.55	59.95
70	13.15	50.50
80	7.10	38.20
90	1.98	20.20

**Results at 40°.**

(Bathrick.)

Wt. per cent Acetone.	Gms. NaNO <sub>3</sub> per 100 Gms. Aq. Acetone.
0.0	105
8.47	91.2
16.8	78.3
25.2	66.4
34.3	57.9
44.1	46.2
53.9	32.8
64.8	23.0
76.0	10.8
87.6	3.2

**SODIUM NITRITE NaNO<sub>2</sub>.**100 gms. H<sub>2</sub>O dissolve 83.3 gms. at 15°.

(Divers — J. Ch. Soc. 75, 86, '99.)

100 gms. abs. methyl alcohol dissolve 4.43 gms. NaNO<sub>2</sub> at 19.5°.100 gms. abs. ethyl alcohol dissolve 0.31 gm. NaNO<sub>2</sub> at 19.5°.

(de Bruyn — Z. physik. Ch. 10, 783, '92)

**SODIUM RHODO NITRITE Na<sub>2</sub>Rh<sub>2</sub>(NO<sub>2</sub>)<sub>12</sub>.**100 gms. H<sub>2</sub>O dissolve 40 gms. at 17°, and 100 gms. at 100°.

(Leidie — Compt. rend. 111, 107, '90.)

**SODIUM OXALATE C<sub>2</sub>O<sub>4</sub>Na<sub>2</sub>.****SOLUBILITY IN WATER.**

(Souhay and Leussen — Liebig's Ann. 99, 33, '56; Pohl — J. pr. Ch. 56, 216, '52.)

t°.	15.5°.	21.8°.	100°.
Gms. Na <sub>2</sub> C <sub>2</sub> O <sub>4</sub> per 100 gms. H <sub>2</sub> O	3.22	3.74	6.33

# SODIUM OXALATE

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## SOLUBILITY OF MIXTURES OF SODIUM OXALATE AND OXALIC ACID IN WATER AT 25°.

(Foote and Andrew — Am. Ch. J. 34, 154, '05.)

Gms. per 100 Gms. Solution.		Mols. per 100 Mols. H <sub>2</sub> O.		Solid Phase.
H <sub>2</sub> C <sub>2</sub> O <sub>4</sub> .	Na <sub>2</sub> C <sub>2</sub> O <sub>4</sub> .	H <sub>2</sub> C <sub>2</sub> O <sub>4</sub> .	Na <sub>2</sub> C <sub>2</sub> O <sub>4</sub> .	
10.20	...	2.274	...	H <sub>2</sub> C <sub>2</sub> O <sub>4</sub> .2H <sub>2</sub> O
10.50	0.83	2.370	0.130	H <sub>2</sub> C <sub>2</sub> O <sub>4</sub> .2H <sub>2</sub> O + HNaC <sub>2</sub> O <sub>4</sub> .H <sub>2</sub> O
9.15	0.71	2.032	0.106	Double Salt, HNaC <sub>2</sub> O <sub>4</sub> .H <sub>2</sub> O
6.88	0.86	1.493	0.125	
1.14	1.25	0.234	0.172	
0.47	3.20	0.098	0.446	HNaC <sub>2</sub> O <sub>4</sub> .H <sub>2</sub> O + Na <sub>2</sub> C <sub>2</sub> O <sub>4</sub>
0.42	3.85	0.090	0.541	
...	3.60	...	0.502	

# SODIUM p NITRO PHENOL C<sub>6</sub>H<sub>4</sub>.ONa(1).NO<sub>2</sub>(4).

## SOLUBILITY IN WATER AND IN AQUEOUS NORMAL SOLUTIONS OF NON ELECTROLYTES.

(Goldschmidt — Z. physik. Ch. 17, 154, '95.)

t°.	Gms. C <sub>6</sub> H <sub>4</sub> .ONa(1).NO <sub>2</sub> (4) per 100 Gms. Solution in:							
	Water.	Alcohol.	Urea.	Glycerine.	Acetone.	Propionitril.	Acetonitril.	Urethane.
23.7	5.597	5.615	6.244	6.188	6.225	6.257	6.065	6.520
28.6	6.721	6.874	7.489	7.440	7.498	7.571	7.328	7.889
30.6	7.256	...	...	...	...	...	...	...
33.6	8.125	8.318	9.000	9.025	9.025	9.066	8.886	9.507
35.9	8.851	...	...	...	...	...	...	...
36.1	8.883	...	9.683	9.688	9.665	9.911	9.667	10.248
40.2	9.881	10.147	10.666	10.777	10.695	10.905	10.667	11.379
45.2	11.235	11.513	12.068	12.229	...	...	...	12.869
50.1	12.730	13.133	13.555	13.785	...	...	...	...

The solid phase is C<sub>6</sub>H<sub>4</sub>.ONa.NO<sub>2</sub>.4H<sub>2</sub>O below 36°, and C<sub>6</sub>H<sub>4</sub>.ONa.NO<sub>2</sub>.2H<sub>2</sub>O above 36° in each case.

# SODIUM PHOSPHATES, Ortho, Hydrogen, and Pyro.

## SOLUBILITY OF EACH IN WATER.

(Mulder; Poggiale.)

t°.	Gms. per 100 Gms. Water.			t°.	Gms. per 100 Gms. H <sub>2</sub> O.		
	Na <sub>3</sub> PO <sub>4</sub> .	Na <sub>2</sub> HPO <sub>4</sub> .	Na <sub>4</sub> P <sub>2</sub> O <sub>7</sub> .		Na <sub>3</sub> PO <sub>4</sub> .	Na <sub>2</sub> HPO <sub>4</sub> .	Na <sub>4</sub> P <sub>2</sub> O <sub>7</sub> .
0	1.5	2.5	3.16	40	31.0	63.9	13.50
10	4.1	3.9	3.95	50	43.0	82.5	17.45
20	11.0	9.3	6.23	60	55.0	91.6	21.83
25	15.5	15.4	8.14	80	81.0	96.6	30.04
30	20.0	24.1	9.95	100	108.0	99.0	40.26

Solid phases, Na<sub>3</sub>PO<sub>4</sub>.12H<sub>2</sub>O, Na<sub>2</sub>HPO<sub>4</sub>.12H<sub>2</sub>O and Na<sub>4</sub>P<sub>2</sub>O<sub>7</sub>.10H<sub>2</sub>O respectively. Sp. Gr. of saturated solution of Na<sub>2</sub>HPO<sub>4</sub> at 15° = 1.047.

100 gms. alcohol of 0.941 Sp. Gr. dissolve 0.33 gm. sodium phosphate at 15.5°.

**SODIUM (Double) PHOSPHATE, FLUORIDE** Na<sub>3</sub>PO<sub>4</sub>.NaF.12H<sub>2</sub>O.  
100 gms. water dissolve 12 gms. of the double sodium salt at 25°, and 57.5 gms. at 70°. Sp. Gr. of solution at 25° = 1.0329; at 70° = 1.1091.

(Briegleb — Liebig's Ann. 97, 95, '86.)

## SOLUBILITY OF SODIUM PHOSPHITES, ETC., IN WATER.

Salt.	Formula.	t°.	Gms. Salt per 100 Gms. H <sub>2</sub> O.	Authority.
Hydrogen Phosphite	(NaH)HPO <sub>3</sub> .2½H <sub>2</sub> O	0	56	(Amat. — Compt. rend. 106, 1351, '88.)
"	"	10	66	
"	"	42	193	
Hypophosphate	Na <sub>2</sub> P <sub>2</sub> O <sub>6</sub> .10H <sub>2</sub> O	cold	3.3	(Salzer — Liebig's Ann. 211, 1, '82.)
Hydrogen Hypophosphate	Na <sub>2</sub> HP <sub>2</sub> O <sub>6</sub> .9H <sub>2</sub> O	?	4.5	
Tri Hydrogen	NaH <sub>2</sub> P <sub>2</sub> O <sub>6</sub> .3H <sub>2</sub> O	cold	6.7	
Di Hydrogen	Na <sub>2</sub> H <sub>2</sub> P <sub>2</sub> O <sub>6</sub> .6H <sub>2</sub> O	cold	2.2	(Salzer — Liebig's Ann. 187, 331, '77.)
Di Hydrogen	Na <sub>2</sub> H <sub>2</sub> P <sub>2</sub> O <sub>6</sub> .6H <sub>2</sub> O	b. pt.	20.0	
Hypophosphite	(NaH)HPO <sub>3</sub> .H <sub>2</sub> O	25	100.0	
Hypophosphite	(NaH)HPO <sub>3</sub> .H <sub>2</sub> O	b. pt.	830	(U. S. P.)

SODIUM SELENATE Na<sub>2</sub>SeO<sub>4</sub>.10H<sub>2</sub>O. SOLUBILITY IN WATER.

(Funk — Ber. 33, 3697, '00.)

t°.	Gms. Na <sub>2</sub> SeO <sub>4</sub> per 100 Gms. Solution.	Mols. Na <sub>2</sub> SeO <sub>4</sub> per 100 Mols. H <sub>2</sub> O.	Solid Phase.	t°.	Gms. Na <sub>2</sub> SeO <sub>4</sub> per 100 Gms. Solution.	Mols. Na <sub>2</sub> SeO <sub>4</sub> per 100 Mols. H <sub>2</sub> O.	Solid Phase.
0	11.74	1.26	Na <sub>2</sub> SeO <sub>4</sub> .10H <sub>2</sub> O	35.2	45.47	7.94	Na <sub>2</sub> SeO <sub>4</sub>
15	25.01	3.18	"	39.5	45.26	7.87	"
18	29.00	3.90	"	50	44.49	7.63	"
25.2	36.91	5.57	"	75	42.83	7.14	"
27	39.18	6.13	"	100	42.14	6.93	"
30	44.05	7.50	"				

Sp. Gr. of saturated solution at 18° = 1.315.

SODIUM STANNATE Na<sub>2</sub>SnO<sub>3</sub>.3H<sub>2</sub>O.100 gms. H<sub>2</sub>O dissolve 67.4 gms. at 0°, and 61.3 gms. at 20°. Sp. Gr. of solution at 0° = 1.472; at 20° = 1.438.

(Ordway — Am. J. Sci. [2] 40, 173, '65.)

SODIUM SULPHATE Na<sub>2</sub>SO<sub>4</sub>. SOLUBILITY IN WATER.

(Mulder; Löwel — Ann. chim. phys. [3] 33, 382, '51; Tilden and Shenstone — Proc. Roy. Soc. (Lond.) 35, 345, '83; Etard — Ann. chim. phys. [7] 2, 527, '94; Funk — Ber. 33, 3701, '00; Berkeley — Trans. Roy. Soc. (Lond.) 203 A, 209, '04.)

t°.	Gms. Na <sub>2</sub> SO <sub>4</sub> per 100 Gms. Solution. Water.		Mols. Na <sub>2</sub> SO <sub>4</sub> per Liter (B.).	Solid Phase.	t°.	Gms. Na <sub>2</sub> SO <sub>4</sub> per 100 Gms. Solution. Water.		Mols. Na <sub>2</sub> SO <sub>4</sub> per Liter (B.).	Solid Phase.
0	4.76	5.0	0.31	Na <sub>2</sub> SO <sub>4</sub> .10H <sub>2</sub> O	50	31.8	46.7	2.92	Na <sub>2</sub> SO <sub>4</sub>
5	6.0	6.4	...	"	60	31.2	45.3	2.83	"
10	8.3	9.0	0.631	"	80	30.4	43.7	2.69	"
15	11.8	13.4	...	"	100	29.8	42.5	2.60	"
20	16.3	19.4	1.32	"	120	29.5	41.95	...	"
25	21.9	28.0	...	"	140	29.6	42	...	"
27.5	25.6	34.0	...	"	160	30.7	44.25	...	"
30	29.0	40.8	2.63	"	230	31.7	46.4	...	"
31	30.6	44.0	...	"	0	16.3	19.5	...	Na <sub>2</sub> SO <sub>4</sub> .7H <sub>2</sub> O
32	32.3	47.8	...	"	5	19.4	24	...	"
32.75	33.6	50.65	3.11	"	10	23.1	30	...	"
33	33.6	50.6	...	Na <sub>2</sub> SO <sub>4</sub>	15	27.0	37	...	"
35	33.4	50.2	...	"	20	30.6	44	...	"
40	32.8	48.8	3.01	"	25	34.6	53	...	"

# SODIUM SULPHATE

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## SOLUBILITY OF MIXTURES OF SODIUM SULPHATE AND MAGNESIUM SULPHATE IN WATER (ASTRAKANITE) $\text{Na}_2\text{Mg}(\text{SO}_4)_2 \cdot 4\text{H}_2\text{O}$ .

(Rooseboom — Rec. trav. chim. 6, 342, '87; Z. physik. Ch. 2, 518, '88.)

t°.	Mols. per 100 Mols. $\text{H}_2\text{O}$ .		Grams per 100 Grams $\text{H}_2\text{O}$ .		Solid Phase.
	$\text{Na}_2\text{SO}_4$ .	$\text{MgSO}_4$ .	$\text{Na}_2\text{SO}_4$ .	$\text{MgSO}_4$ .	
22	2.95	4.70	23.3	31.4	Astrakanite
24.5	3.45	3.68	27.2	24.6	"
30	3.59	3.59	28.4	24.1	"
35	3.71	3.71	29.4	24.8	"
47	3.6	3.6	28.4	24.1	"
22	2.95	4.70	23.3	31.4	Astrakanite + $\text{Na}_2\text{SO}_4$
24.5	3.45	3.62	27.2	24.2	"
30	4.58	2.91	36.1	19.1	"
35	4.3	2.76	33.9	18.44	"
18.5	3.41	4.27	43.0	45.5	Astrakanite + $\text{MgSO}_4$
22	2.85	4.63	35.2	48.9	"
24.5	2.68	4.76	32.5	50.3	"
30	2.3	5.31	25.9	55.0	"
35	1.73	5.88	23.5	59.4	"

## SOLUBILITY OF MIXTURES OF SODIUM SULPHATE, POTASSIUM CHLORIDE, POTASSIUM SULPHATE, ETC., IN WATER.

(Meyerhoffer and Saunders — Z. physik. Ch. 28, 469; 31, 382, '99.)

t°.	Sp. Gr. of Solutions.	Mols. per 1000 Mols. $\text{H}_2\text{O}$ .				Solid Phase.
		$\text{SO}_4$	$\text{K}_2$	$\text{Na}_2$	$\text{Cl}_2$	
*4.4	...	5.42	14.39	51.83	60.8	$\text{K}_2\text{Na}(\text{SO}_4)_2 + \text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O} + \text{KCl} + \text{NaCl}$
0.2	...	3.35	12.78	50.93	60.36	$\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O} + \text{KCl} + \text{NaCl}$
-0.4	...	3.59	16.38	40.75	53.54	$\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O} + \text{KCl} + \text{K}_2\text{Na}(\text{SO}_4)_2$
16.3	...	4.72	17.58	50.56	63.42	$\text{K}_2\text{Na}(\text{SO}_4)_2 + \text{KCl} + \text{NaCl}$
24.8	1.2484	4.37	20.00	48.36	64.01	$\text{K}_2\text{Na}(\text{SO}_4)_2 + \text{KCl} + \text{NaCl}$
*16.3	...	16.29	9.16	61.06	53.93	$\text{K}_2\text{Na}(\text{SO}_4)_2 + \text{NaCl} + \text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O} + \text{Na}_2\text{SO}_4$
24.5	1.2625	14.45	9.90	58.46	53.91	$\text{K}_2\text{Na}(\text{SO}_4)_2 + \text{NaCl} + \text{Na}_2\text{SO}_4$
0.3	...	2.75	25.77	17.93	40.95	$\text{K}_2\text{Na}(\text{SO}_4)_2 + \text{KCl} + \text{K}_2\text{SO}_4$
25.0	1.2034	2.94	36.20	14.80	48.06	$\text{K}_2\text{Na}(\text{SO}_4)_2 + \text{KCl} + \text{K}_2\text{SO}_4$
*17.9	1.2474	13.84	0.0	62.57	48.70	$\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O} + \text{Na}_2\text{SO}_4 + \text{NaCl}$
*30.1	1.2890	50.41	10.08	40.33	0.0	$\text{K}_2\text{Na}(\text{SO}_4)_2 + \text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O} + \text{Na}_2\text{SO}_4$
-21.4	...	...	...	46.61	46.36	$\text{NaCl} \cdot 2\text{H}_2\text{O} + \text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$
-23.7	...	...	10.51	39.58	50.09	$\text{NaCl} \cdot 2\text{H}_2\text{O} + \text{KCl}$
-10.9	...	1.45	30.68	...	29.23	$\text{KCl} + \text{K}_2\text{SO}_4$
-3	...	16.25	10.03	6.21	...	$\text{K}_2\text{Na}(\text{SO}_4)_2 + \text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$
-3	...	16.24	10.03	6.21	...	$\text{K}_2\text{Na}(\text{SO}_4)_2 + \text{K}_2\text{SO}_4$
-14	...	1.39	25.59	8.78	32.94	$\text{K}_2\text{Na}(\text{SO}_4)_2 + \text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O} + \text{KCl}$
-14	...	1.39	25.59	8.78	32.94	$\text{K}_2\text{Na}(\text{SO}_4)_2 + \text{K}_2\text{SO}_4 + \text{KCl}$
-23.3	...	0.41	15.15	44.20	58.97	$\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O} + \text{KCl} + \text{NaCl} \cdot 2\text{H}_2\text{O}$

\* Indicates transition points.

**SOLUBILITY OF SODIUM SULPHATE IN AQUEOUS SOLUTIONS OF  
SULPHURIC ACID.**

(D'Ans, Shepherd and Günther—Z. anorg. Chem. 49, 356-61, '06.)

Gms. per 1000 Gms. Solution.		Mols. per 1000 gms. Solution.		Solid Phase.
H <sub>2</sub> SO <sub>4</sub>	Na <sub>2</sub> SO <sub>4</sub>	H <sub>2</sub> SO <sub>4</sub>	Na <sub>2</sub> SO <sub>4</sub>	
0.0	219.0	0.0	1.541	Na <sub>2</sub> SO <sub>4</sub> · 10 H <sub>2</sub> O
28.1	237.4	0.286	1.671	"
33.2	247.5	0.338	1.742	"
86.7	320.7	0.884	2.256	Na <sub>2</sub> SO <sub>4</sub> · 10 H <sub>2</sub> O + Na <sub>2</sub> SO <sub>4</sub>
154.6	335.8	1.576	2.363	Na <sub>2</sub> H(SO <sub>4</sub> ) <sub>2</sub> · H <sub>2</sub> O + Na <sub>2</sub> SO <sub>4</sub>
163.5	346.4	1.666	2.437	Na <sub>2</sub> H(SO <sub>4</sub> ) <sub>2</sub> + Na <sub>2</sub> SO <sub>4</sub>
256.3	297.4	2.611	2.091	Na <sub>2</sub> H(SO <sub>4</sub> ) <sub>2</sub> + Na <sub>2</sub> H(SO <sub>4</sub> ) <sub>2</sub> · H <sub>2</sub> O

**SOLUBILITY OF SODIUM SULPHATE IN AQUEOUS SOLUTIONS OF  
SODIUM CHLORIDE AT DIFFERENT TEMPERATURES.**

(Seidell—Am. Ch. J. 27, 52, '02.)

**Results at 10°.**

Sp. Gr. of Solutions.	Gms. per 100 Gms. H <sub>2</sub> O.	
	NaCl.	Na <sub>2</sub> SO <sub>4</sub> .
1.080	0.0	9.14
1.083	4.28	6.42
1.102	9.60	4.76
1.150	15.65	3.99
1.164	21.82	3.97
1.192	28.13	4.15
1.207	30.11	4.34
1.217	32.27	4.59
1.223	33.76	4.75

**Results at 21.5°.**

Sp. Gr. of Solutions.	Gms. per 100 Gms. H <sub>2</sub> O.	
	NaCl.	Na <sub>2</sub> SO <sub>4</sub> .
1.164	0.0	21.33
1.169	9.05	15.48
1.199	17.48	13.73
1.214	20.41	13.62
1.243	26.01	15.05
1.244	26.53	14.44
1.244	27.74	13.39
1.244	31.25	10.64
1.243	31.80	10.28
1.245	32.10	8.43
1.219	33.69	4.73
1.212	34.08	2.77
1.197	35.46	0.00

**Results at 27°.**

Sp. Gr. of Solutions.	Gms. per 100 Gms. H <sub>2</sub> O.	
	NaCl.	Na <sub>2</sub> SO <sub>4</sub> .
1.228	0.0	31.10
1.230	2.66	28.73
1.230	5.29	27.17
1.235	7.90	26.02
1.259	16.13	24.83
1.253	18.91	21.39
1.249	19.64	20.11
1.245	20.77	19.29
1.238	32.33	9.53

**Results at 30°.**

Sp. Gr. of Solutions.	Gms. per 100 Gms. H <sub>2</sub> O.	
	NaCl.	Na <sub>2</sub> SO <sub>4</sub> .
1.281	0.0	39.70
1.282	2.45	38.25
1.284	5.61	36.50
1.290	7.91	35.96
1.276	10.61	31.64
1.270	12.36	29.87
1.258	15.65	25.02
1.249	18.44	21.30
1.244	20.66	19.06
1.236	32.43	9.06

**Results at 33°.**

Sp. Gr. of Solutions.	Gms. per 100 Gms. H <sub>2</sub> O.	
	NaCl.	Na <sub>2</sub> SO <sub>4</sub> .
1.329	0.0	48.48
1.323	1.22	46.49
1.318	1.99	45.16
1.315	2.64	44.09
1.309	3.47	42.61
1.265	12.14	29.32
1.237	21.87	16.83
1.234	32.84	8.76
1.217	33.99	4.63
1.208	34.77	2.75

**Results at 35°.**

Sp. Gr. of Solutions.	Gms. per 100 Gms. H <sub>2</sub> O.	
	NaCl.	Na <sub>2</sub> SO <sub>4</sub> .
1.324	0.0	47.94
1.314	2.14	43.75
1.256	13.57	26.26
1.238	18.78	19.74
1.231	31.91	8.28
1.193	35.63	0.00

# SODIUM SULPHATE

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## SOLUBILITY OF SODIUM SULPHATE IN AQUEOUS ETHYL ALCOHOL. (de Bruyn — Z. physik. Chem. 32, 101, '00.)

t°.	Content of Alcohol.	Gms. Na <sub>2</sub> SO <sub>4</sub> per 100 Gms. Aq. Alcohol.	Gms. per 100 Gms. Solution.			Solid Phase.
			H <sub>2</sub> O.	C <sub>2</sub> H <sub>5</sub> OH.	Na <sub>2</sub> SO <sub>4</sub> .	
15	0.7	12.7	88.7	0.0	11.3	Na <sub>2</sub> SO <sub>4</sub> .10H <sub>2</sub> O
"	9.2	6.7	85.1	8.6	6.3	"
"	19.4	2.6	78.6	18.9	2.9	"
"	39.7	0.5	60.0	39.5	0.5	"
"	58.9	0.1	41.1	58.8	0.1	"
"	72.0	0.0	28.0	72.0	0.0	"
"	0.0	37.4	72.8	0.0	27.2	Na <sub>2</sub> SO <sub>4</sub> .7H <sub>2</sub> O
"	11.2	16.3	76.5	9.5	14.0	"
"	20.6	7.0	74.3	19.2	6.5	"
"	30.2	2.0	68.4	29.6	2.0	"
25	0.0	28.2	78.1	0.0	21.9	Na <sub>2</sub> SO <sub>4</sub> .10H <sub>2</sub> O
"	10.6	13.9	78.5	9.3	12.2	"
"	24.0	4.5	72.8	22.9	4.3	"
"	54.0	0.4	45.6	54.0	0.4	"
36	0.0	49.3	67.0	0.0	33.0	Na <sub>2</sub> SO <sub>4</sub>
"	8.8	29.2	70.6	6.8	22.6	"
"	12.8	22.4	71.2	10.5	18.3	"
"	17.9	15.4	71.1	15.5	13.4	"
"	18.1	15.3	71.0	15.7	13.3	"
"	28.9	5.4	66.5	28.4	5.1	"
"	48.7	0.8	50.9	48.3	0.8	"
45	0.0	47.9	67.6	0.0	32.4	"
"	9.0	27.5	71.3	7.1	21.6	"
"	14.5	19.2	71.8	12.1	16.1	"
"	20.6	12.3	70.6	18.4	10.0	"
"	31.0	5.1	65.6	29.5	4.9	"

Between certain concentrations of the aqueous alcohol the liquid separates into two layers at 25°, 36° and 45°.

t°.	Upper Layer.			Lower Layer.		
	Gms. H <sub>2</sub> O.	Gms. C <sub>2</sub> H <sub>5</sub> OH.	Gms. Na <sub>2</sub> SO <sub>4</sub> .	Gms. H <sub>2</sub> O.	Gms. C <sub>2</sub> H <sub>5</sub> OH.	Gms. Na <sub>2</sub> SO <sub>4</sub> .
25	66.5	27.3	6.2	67.4	5.1	27.5
"	68.1	23.9	8.0	68.5	6.0	25.5
"	68.3	23.1	8.6	68.3	6.7	25.0
36	...	...	...	66.6	4.1	29.3
"	57.7	38.4	3.9	...	...	...
"	65.0	28.3	6.7	68.8	5.9	25.3
"	68.1	21.2	10.7	68.9	9.4	21.7
45	61.8	32.9	5.3	...	...	...
"	65.8	25.3	8.9	68.4	8.8	22.8
"	66.0	24.0	10.0	68.6	10.1	21.3

**SOLUBILITY OF SODIUM SULPHATE IN AQUEOUS PROPYL ALCOHOL  
AT 20°.**

(Linebarger — Am. Ch. J. 14, 380, '92.)

Gms. C <sub>3</sub> H <sub>7</sub> OH per 100 Gms. Alcohol-Water Mixture.	Gms. Na <sub>2</sub> SO <sub>4</sub> per 100 Gms. Sat. Solution.	Gms. C <sub>3</sub> H <sub>7</sub> OH per 100 Gms. Alcohol-Water Mixture.	Gms. Na <sub>2</sub> SO <sub>4</sub> per 100 Gms. Sat. Solution.
42.20	1.99	56.57	0.55
49.77	1.15	60.64	0.44
55.65	0.72	62.81	0.38

100 gms. H<sub>2</sub>O dissolve 183.7 gms. sugar + 30.5 gms. Na<sub>2</sub>SO<sub>4</sub> at 31.25°, or 100 gms. sat. solution contain 52.2 gms. sugar + 9.6 gms. Na<sub>2</sub>SO<sub>4</sub>.

(Köhler — Z. Ver. Zuckerind. 47, 447, '97.)

**SODIUM (Bi) SULPHATE NaHSO<sub>4</sub>.**

100 gms. H<sub>2</sub>O dissolve 28.6 gms. at 25°, and 50.0 gms. at 100°.

100 gms. alcohol dissolve 1.4 gms. at 25°. (U. S. P.)

**SODIUM THIO SULPHATE Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>.**

**SOLUBILITY IN WATER.**

(Young and Burke — J. Am. Chem. Soc. 26, 1417, '04.)

t°.	Gms. Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> per 100 Gms.		Solid Phase.	t°.	Gms. Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> per 100 Gms.		Solid Phase.
	Solution.	Water.			Solution.	Water.	
10	37.38	59.69	Pentahydrate (com.)	20	62.11	163.92	Monohydrate
20	41.20	70.07	"	25	62.73	168.32	"
25	43.15	75.90	"	30	63.53	174.20	"
30	45.19	82.45	"	20	55.15	122.68	Dihydrate
35	47.71	91.24	"	25	56.03	127.43	"
40	50.83	103.37	"	30	57.13	133.27	"
45	55.33	123.87	"	35	58.13	138.84	"
20	49.38	97.55	Pentahydrate (S)	40	59.17	144.92	"
25	52.15	108.98	"	50	62.28	165.11	"
28	54.48	119.69	"	33.5	58.59	141.48	Tetrahydrate (?)
29.5	55.85	126.50	"	36.2	60.51	153.23	"
30	56.57	130.26	"	36.6	62.80	168.82	"

100 gms. alcohol dissolve 0.0025 gm. Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> and 0.0034 gm. Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>·5H<sub>2</sub>O at room temperature. (Böttker — Z. physik. Chem. 22, 510, '97.)

100 gms. alcohol of 0.941 Sp. Gr. dissolve 33.3 gms. at 15.5°.

(See also Parmentier — Compt. rend. 122, 136, '96.)

**SODIUM SULPHITE Na<sub>2</sub>SO<sub>3</sub>.**

100 gms. H<sub>2</sub>O dissolve 14.1 gms. at 0°, 25.8–28.7 gms. at 20°, and 49.5 gms. at 40°.

(Kremers — Pogg. Ann. 99, 50, '56.)

**SODIUM TELLURIATE Na<sub>2</sub>TeO<sub>4</sub>·2H<sub>2</sub>O.**

100 gms. H<sub>2</sub>O dissolve 0.77 gm. Na<sub>2</sub>TeO<sub>4</sub> at 18°, and 2.0 gms. at 100°. Solid phase Na<sub>2</sub>TeO<sub>4</sub>·2H<sub>2</sub>O.

100 gms. H<sub>2</sub>O dissolve 1.43 gms. Na<sub>2</sub>TeO<sub>4</sub> at 18°, and 2.5 gms. at 50°. Solid phase Na<sub>2</sub>TeO<sub>4</sub>·4H<sub>2</sub>O.

(Mylus — Ber. 24, 2208, '01.)



**SODIUM TUNGSTATE**

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**SODIUM TUNGSTATE** (Wolframate)  $\text{Na}_2\text{WO}_4 \cdot 2\text{H}_2\text{O}$ .**SOLUBILITY IN WATER.**

(Funk — Ber. 33, 3701, '00.)

t°.	Gms. $\text{Na}_2\text{WO}_4$ per 100 Gms. Solution.	Mols. $\text{Na}_2\text{WO}_4$ per 100 Mols. $\text{H}_2\text{O}$ .	Solid Phase.	t°.	Gms. $\text{Na}_2\text{WO}_4$ per 100 Gms. Solution.	Mols. $\text{Na}_2\text{WO}_4$ per 100 Mols. $\text{H}_2\text{O}$ .	Solid Phase.
-5	30.60	2.70	$\text{Na}_2\text{WO}_4 \cdot 10\text{H}_2\text{O}$	-3.5	41.67	4.37	$\text{Na}_2\text{WO}_4 \cdot 3\text{H}_2\text{O}$
-4	31.87	2.86	"	+5	41.73	4.39	"
-3.5	32.98	3.01	"	18	42.0	4.40	"
-2	34.52	3.23	"	21	42.27	4.48	"
0	36.54	3.52	"	43.5	43.98	4.81	"
+3	39.20	3.95	"	80.5	47.65	5.57	"
5	41.02	4.26	"	100	49.31	5.95	"

Sp. Gr. of sat. solution at 18° = 1.573. For Sp. Gr. determinations of aqueous solutions at 20°, see Pawlewski — Ber. 33, 1223, '00.

**SODIUM FLUO ZIRCONATE**  $5\text{NaF} \cdot \text{ZrF}_6$ .

100 gms.  $\text{H}_2\text{O}$  dissolve 0.387 gm. at 18°, and 1.67 gms. at 100°.

(Marignac — J. pr. Chem. 83, 202, '61.)

**STRONTIUM BENZOATE**  $\text{Sr}(\text{C}_6\text{H}_5\text{O}_2)_2 \cdot \text{H}_2\text{O}$ .**SOLUBILITY IN WATER.**

(Paletta — Gazz. chim. ital 36, II, 67, '06.)

t°.	15.7°	24.7°	31.4°	40.9°
Gms. $\text{Sr}(\text{C}_6\text{H}_5\text{O}_2)_2$ per 100 gms. solution	5.31	5.4	5.56	5.77

**STRONTIUM BROMATE**  $\text{Sr}(\text{BrO}_3)_2$ .

One liter of aqueous solution contains 0.9 gram molecules or 309 gms.  $\text{Sr}(\text{BrO}_3)_2$  at 18°.

(Kohlrausch — Sitzb. K. Akad. Wiss. (Berlin) 90, '97.)

**STRONTIUM BROMIDE**  $\text{SrBr}_2 \cdot 6\text{H}_2\text{O}$ .**SOLUBILITY IN WATER.**

(Average curve from results of Kremers — Pogg. Ann. 103, 65, '58; and Etard — Ann. chim. phys. [7] 2, 540, '94.)

t°.	Gms. $\text{SrBr}_2$ per 100 Gms. Solution.	Water.	t°.	Gms. $\text{SrBr}_2$ per 100 Gms. Solution.	Water.
0	46.0	85.2	40	55.2	123.2
10	48.3	93.0	50	57.6	135.8
20	50.6	102.4	60	60.0	150.0
25	51.7	107.0	80	64.5	181.8
30	52.8	111.9	100	69.0	222.5

Sp. Gr. of sat. solution at 20° approximately 1.70.

100 gms. abs. alcohol dissolve 64.5 gms.  $\text{SrBr}_2$  at 0°. Sp. Gr. of solution = 1.21.

(Fonzes; Diacon — J. pharm. chim. [6] 1, 59, '95.)

**STRONTIUM CARBONATE**  $\text{SrCO}_3$ .

One liter of water dissolves 0.0082 gm. at 8.8° and 0.0109 gm. at 24° by conductivity method.

(Holleman — Z. physik. Chem. 12, 130, '93; Kohlrausch and Rose — *Ibid.* 12, 241, '93.)

One liter of water saturated with  $\text{CO}_2$  dissolves 1.19 gms.  $\text{Sr}(\text{HCO}_3)_2$ .

**STRONTIUM CHLORATE**  $\text{Sr}(\text{ClO}_4)_2$ .

100 gms.  $\text{H}_2\text{O}$  dissolve 174.9 gms.  $\text{Sr}(\text{ClO}_4)_2$ , or 100 gms. sat. solution contain 63.6 gms. at  $18^\circ$ . Sp. Gr. of solution is 1.839.

(Mylius and Funk — Ber. 30, 1718, '97.)

**STRONTIUM CHLORIDE**  $\text{SrCl}_2 \cdot 6\text{H}_2\text{O}$ .**SOLUBILITY IN WATER.**

(Average curve from the results of Mulder; Etard; see also Tilden — J. Chem. Soc. 45, 409, '84.)

$t^\circ$ .	Gms. $\text{SrCl}_2$ per 100 Gms.		Solid Phase.	$t^\circ$ .	Gms. $\text{SrCl}_2$ per 100 Gms.		Solid Phase.
	Solution.	Water.			Solution.	Water.	
-20	26.0	35.1	$\text{SrCl}_2 \cdot 6\text{H}_2\text{O}$	60	45.0	81.8	$\text{SrCl}_2 \cdot 6\text{H}_2\text{O}$
0	30.3	43.5	"	70	46.2	85.9	$\text{SrCl}_2 \cdot 6\text{H}_2\text{O}$
10	32.3	47.7	"	80	47.5	90.5	"
20	34.6	52.9	"	100	50.2	100.8	"
25	35.8	55.8	"	120	53.0	112.8	"
30	37.0	58.7	"	140	55.6	125.2	"
40	39.5	65.3	"	160	58.5	141.0	"
50	42.0	72.4	"	180	62.0	163.1	"

Transition temperature about  $62.5^\circ$ . Sp. Gr. of sat. solution at  $0^\circ$  = 1.334; at  $15^\circ$  = 1.36.

**SOLUBILITY OF STRONTIUM CHLORIDE IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID AT  $0^\circ$ .**

(Engel — Ann. chim. phys. [6] 13, 376, '88.)

Mg. Mols. per 10 cc. Solution.		Sp. Gr. of Solution.	Grams per 100 cc. Solution.	
$\frac{1}{2}\text{SrCl}_2$ .	HCl.		$\text{SrCl}_2$ .	HCl.
51.6	0	1.334	40.9	0.0
44.8	6.1	1.304	35.5	2.22
37.85	12.75	1.269	30.0	4.65
27.2	23.3	1.220	21.56	8.49
22.0	28.38	1.201	17.44	10.35
14.0	37.25	1.167	11.09	13.58
4.25	52.75	1.133	3.37	19.23

100 gms. abs. methyl alcohol dissolve 63.3 gms.  $\text{SrCl}_2 \cdot 6\text{H}_2\text{O}$  at  $6^\circ$ .

100 gms. abs. ethyl alcohol dissolve 3.8 gms.  $\text{SrCl}_2 \cdot 6\text{H}_2\text{O}$  at  $6^\circ$ .

(de Bruyn — Z. physik. Chem. 10, 787, '92.)

**SOLUBILITY OF STRONTIUM CHLORIDE IN AQUEOUS ETHYL ALCOHOL SOLUTIONS AT  $18^\circ$ .**

(Gerardin — Ann. chim. phys. [4] 5, 156, '65.)

Sp. Gr. of Aq. Alcohol at $0^\circ$ .	Wt. per cent Alcohol.	Gms. $\text{SrCl}_2$ per 100 Gms. Alcohol.	Sp. Gr. of Aq. Alcohol at $0^\circ$ .	Wt. per cent Alcohol.	Gms. $\text{SrCl}_2$ per 100 Gms. Alcohol.
0.990	6	49.81	0.939	45	26.8
0.985	10	47.0	0.909	59	19.2
0.973	23	39.6	0.846	86	4.9
0.966	30	35.9	0.832	91	3.2
0.953	38	30.4			

**STRONTIUM CHROMATE** 318**STRONTIUM CHROMATE**  $\text{SrCrO}_4$ .

SOLUBILITY IN WATER, ETC., AT 15°.  
(Fresenius — Z. anal. Chem. 29, 419, '90; 30, 672, '91.)

Solvent.	Gms. $\text{SrCrO}_4$ per 100 Gms. Solvent.	Solvent.	Gms. $\text{SrCrO}_4$ per 100 Gms. Solvent.
Water	0.12	Aq. Ethyl Alcohol (29%)	0.0132
Aq. $\text{NH}_4\text{Cl}$ (5%)	0.195	Aq. Ethyl Alcohol (53%)	0.002
Aq. $\text{CH}_3\text{COOH}$ (1%)	1.57		

**STRONTIUM FLUORIDE**  $\text{SrF}_2$ .

One liter of water dissolves 1.87 mg. equiv. or 0.117 gm.  $\text{SrF}_2$  at 18°, by conductivity method. (Kohlrausch — Z. physik. Chem. 50, 356, '04-'05.)

**STRONTIUM HYDROXIDE**  $\text{Sr(OH)}_2$ .

SOLUBILITY IN WATER.

(Scheibler — N. Z. Rubenzuckerind. 7, 257; abstract in J. pharm. chim. [5] 8, 540, '83.)

t°.	Grams per 100 Grams Solution.		Grams per 100 cc. Solution.	
	$\text{SrO}$ .	$\text{Sr(OH)}_2 \cdot 8\text{H}_2\text{O}$ .	$\text{SrO}$ .	$\text{Sr(OH)}_2 \cdot 8\text{H}_2\text{O}$ .
0	0.35	0.90	0.35	0.90
10	0.48	1.23	0.48	1.23
20	0.68	1.74	0.68	1.74
30	1.00	2.57	1.01	2.59
40	1.48	3.80	1.51	3.87
50	2.13	5.46	2.18	5.59
60	3.03	7.77	3.12	8.00
70	4.35	11.16	4.55	11.67
80	6.56	16.83	7.02	18.01
90	12.0	30.78	13.64	34.99
100	18.6	47.71	22.85	58.61

**STRONTIUM IODATE**  $\text{Sr(IO}_3)_2$ .

100 gms.  $\text{H}_2\text{O}$  dissolve 0.026 gm. at 15°, and 0.72–0.91 gm. at 100°. (Gay-Lussac; Rammelsberg — Pogg. Ann. 44, 575, '38.)

**STRONTIUM IODIDE**  $\text{SrI}_2 \cdot 6\text{H}_2\text{O}$ .

SOLUBILITY IN WATER.

(Average curve from the results of Kremers — Pogg. Ann. 103, 65, '58; and Etard — Ann. chim. phys. [7] 2, 528, '74.)

t°.	Gms. $\text{SrI}_2$ per 100 Gms		Solid Phase.	t°.	Gms. $\text{SrI}_2$ per 100 Gms.		Solid Phase.
	Solution.	Water.			Solution.	Water.	
0	62.3	165.3	$\text{SrI}_2 \cdot 6\text{H}_2\text{O}$	90	78.5	365.2	$\text{SrI}_2 \cdot 2\text{H}_2\text{O}$
20	64.0	177.8	"	100	79.3	383.1	"
40	65.7	191.5	"	120	80.7	418.1	"
60	68.5	217.5	"	140	82.5	471.5	"
80	73.0	270.4	"	175	85.6	594.4	"

Transition temperature about 90°. Sp. Gr. of sat. solution at 20° = 2.15.

100 gms. saturated solution of strontium iodide in absolute alcohol contain 2.6 gms.  $\text{SrI}_2$  at –20, 3.1 gms. at +4°, 4.3 gms. at 39°, and 4.7 gms. at 82°. (Etard.)

**STRONTIUM MALATE**  $\text{SrC}_4\text{H}_4\text{O}_6$ .

## SOLUBILITY IN WATER.

(Cantoni and Basadonna — Bull. soc. chim. 35, 731, '06.)

t°	Gms. per 100 cc. Solution.	t°	Gms. per 100 cc. Solution.	t°	Gms. per 100 cc. Solution.
20	0.448	40	1.385	55	2.460
25	0.550	45	1.743	60	2.821
30	0.752	50	2.098	65	3.148
35	1.036			70	3.360

**STRONTIUM MOLYBDATE**  $\text{SrMoO}_4$ .100 gms.  $\text{H}_2\text{O}$  dissolve 0.0104 gm.  $\text{SrMoO}_4$  at 17°.

(Smith and Bradbury — Ber. 24, 2930, '91.)

**STRONTIUM NITRATE**  $\text{Sr}(\text{NO}_3)_2$ .

## SOLUBILITY IN WATER.

(Mulder; see also Etard for slightly lower results.)

t°	Gms. $\text{Sr}(\text{NO}_3)_2$ per 100 Gms.		Solid Phase.	t°	Gms. $\text{Sr}(\text{NO}_3)_2$ per 100 Gms.		Solid Phase.
	Solution.	Water.			Solution.	Water.	
0	28.3	39.5	$\text{Sr}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$	40	47.7	91.3	$\text{Sr}(\text{NO}_3)_2$
10	35.5	54.9	"	50	48.1	92.6	"
20	41.5	70.8	"	60	48.5	94.0	"
25	44.1	79.0	"	80	49.3	97.2	"
30	46.7	87.6	"	100	50.3	101.1	"

Transition temperature about 31°. Sp. Gr. of sat. solution at 20° = 1.44.

100 gms. absolute alcohol dissolve 0.024 gm.  $\text{Sr}(\text{NO}_3)_2$ .100 gms. rectified spirit dissolve 0.50 gm.  $\text{Sr}(\text{NO}_3)_2$ .

(Hill — Pharm. J. Trans. [3] 19, 420, '88.)

**STRONTIUM OXALATE**  $\text{SrC}_2\text{O}_4 \cdot \text{H}_2\text{O}$ .One liter of aqueous solution contains 0.52 mg. equivalent  $\text{SrC}_2\text{O}_4$  or 0.046 gm. at 18°, conductivity method.

(Kohlrausch — Z. physik. Chem. 50, 356, '04-'05.)

## SOLUBILITY OF STRONTIUM OXALATE IN AQUEOUS ACETIC ACID SOLUTIONS AT 26°-27°.

(Herz and Muhs — Ber. 36, 3715, '03.)

Normality of Acetic Acid.	Gms. per 100 cc. Solution.		Normality of Acetic Acid.	Gms. per 100 cc. Solution.	
	$\text{CH}_3\text{COOH}$ .	Residue $\text{SrC}_2\text{O}_4 \cdot \text{H}_2\text{O}$ .		$\text{CH}_3\text{COOH}$ .	Residue $\text{SrC}_2\text{O}_4 \cdot \text{H}_2\text{O}$ .
0.0	0.0	0.009	3.86	23.16	0.0898
0.58	3.48	0.0526	5.79	34.74	0.0496
1.45	8.70	0.0622	16.26	97.56	0.0060
2.89	17.34	0.0642			

**STRONTIUM SALICYLATE**  $\text{Sr}(\text{C}_6\text{H}_4\text{OH.COO})_2 \cdot 2\text{H}_2\text{O}$ .100 gms.  $\text{H}_2\text{O}$  dissolve 5.55 gms. at 25°, and 28.6 gms. at b. pt.

(U. S. P.)

100 cc. aqueous solution contain 1.830 gms. anhydrous salt. (Barthe.)

100 gms. alcohol dissolve 1.5 gms. at 25°, and 9.52 gms. at b. pt.

(U. S. P.; Barthe — Bull. soc. chim. [3] 12, 519, '94.)

## STRONTIUM SULPHATE 320

### STRONTIUM SULPHATE $\text{SrSO}_4$ .

One liter of aqueous solution contains 1.24 mg. equivalents or 0.114 gm.  $\text{SrSO}_4$  at  $18^\circ$ , by conductivity method.

(Kohlrausch — Z. physik. Chem. 50, 356, '04-'05; Halleman — *Ibid.* 12, 129, '93; Wolfmann — Öster. Ung. Z. Zuckerind. 25, 997, '97.)

### SOLUBILITY OF STRONTIUM SULPHATE IN AQUEOUS SOLUTIONS OF HYDROCHLORIC, NITRIC, CHLORACETIC AND FORMIC ACIDS.

(Banthisch — J. pr. Chem. [2] 29, 52, '84.)

cc. of Aq. Acid containing 1 Mg. Equiv. in each case.	In Aq. HCl Gms. per 100 cc. Sol.		In Aq. $\text{HNO}_3$ Gms. per 100 cc. Sol.		In Aq. $\text{CH}_3\text{ClCOOH}$ Gms. per 100 cc. Sol.		In Aq. $\text{HCOOH}$ Gms. per 100 cc. Sol.	
	HCl.	$\text{SrSO}_4$ .	$\text{HNO}_3$ .	$\text{SrSO}_4$ .	$\text{CH}_3\text{ClCOOH}$ .	$\text{SrSO}_4$ .	$\text{HCOOH}$ .	$\text{SrSO}_4$ .
0.2	18.23	0.161	31.52	0.381	...	...	...	...
0.5	7.29	0.207	12.61	0.307	...	...	...	...
1.0	3.65	0.188	6.30	0.217	94.47	0.026	46.02	0.024
2.0	1.82	0.126	3.15	0.138	47.23	0.022	...	...
10.0	0.36	0.048	0.63	0.049	...	...	...	...

### SOLUBILITY OF STRONTIUM SULPHATE IN SULPHURIC ACID SOLUTIONS.

t°.	Conc. of $\text{H}_2\text{SO}_4$ .	Gms. $\text{SrSO}_4$ per 100 Gms. Acid.	Authority.
ord.	concentrated	5.68	(Struve — Z. anal. Chem. 9, 34, 1870.)
"	fuming	9.77	" "
"	91%	0.08	(Varenne and Paulean — Compt. rend. 93, 1016, '81.)
70	Sp. Gr. 1.843 = 99%	14.0	(Garside — Chem. News, 31, 245, '75.)

### SOLUBILITY OF STRONTIUM SULPHATE IN AQUEOUS SALT SOLUTIONS.

(Virck — Chem. Centralb. 402, '62.)

In Aq. NaCl.		In Aq. KCl.		In Aq. $\text{MgCl}_2$ .		In Aq. $\text{CaCl}_2$ .	
(a.)	(b.)	(a.)	(b.)	(a.)	(b.)	(a.)	(b.)
8.44	0.165	8.22	0.193	1.59	0.199	8.67	0.176
15.54	0.219	12.54	0.193	4.03	0.206	16.51	0.185
22.17	0.181	18.08	0.251	13.63	0.242	33.70	0.171

(a) = Gms. salt per 100 gms. aq. solution. (b) = Gms.  $\text{SrSO}_4$  per 100 gms. solvent.

## STRONTIUM TARTRATE $\text{SrC}_4\text{H}_4\text{O}_6 \cdot 3\text{H}_2\text{O}$ .

### SOLUBILITY IN WATER.

(Cantoni and Zachoder — Bull. soc. chim. [3] 33, 751, '05.)

t°.	Gms. $\text{SrC}_4\text{H}_4\text{O}_6 \cdot 3\text{H}_2\text{O}$ per 100 cc. Solution.	t°.	Gms. $\text{SrC}_4\text{H}_4\text{O}_6 \cdot 3\text{H}_2\text{O}$ per 100 cc. Solution.	t°.	Gms. $\text{SrC}_4\text{H}_4\text{O}_6 \cdot 3\text{H}_2\text{O}$ per 100 cc. Solution.
0	0.112	25	0.224	60	0.480
10	0.149	30	0.252	70	0.580
15	0.174	40	0.328	80	0.680
20	0.200	50	0.407	85	0.755

321 **STRONTIUM TARTRATE**

**SOLUBILITY OF STRONTIUM TARTRATE IN AQUEOUS SOLUTIONS OF ACETIC ACID AT 26°-27°.**  
(Herz and Muhs — Ber. 36, 3715, '03.)

Normality of Acetic Acid.	Gms. per 100 cc. Solution.		Normality of Acetic Acid.	Gms. per 100 cc. Solution.	
	CH <sub>3</sub> COOH.	SrC <sub>4</sub> H <sub>4</sub> O <sub>6</sub> .3H <sub>2</sub> O.		CH <sub>3</sub> COOH.	SrC <sub>4</sub> H <sub>4</sub> O <sub>6</sub> .3H <sub>2</sub> O.
0.0	0.0	0.227	3.77	21.85	1.051
0.565	3.39	0.678	5.65	33.90	0.982
1.425	8.15	0.864	16.89	101.34	0.184
2.85	17.10	0.996			

**STRONTIUM (Di) TUNGSTATE** SrW<sub>2</sub>O<sub>7</sub>.3H<sub>2</sub>O.

100 cc. H<sub>2</sub>O dissolve 0.35 gm. at 15°.

(Lefort — Ann. chim. phys. [5] 15, 326, '78.)

**STRYCHNINE** C<sub>21</sub>H<sub>22</sub>N<sub>2</sub>O<sub>2</sub>.

**SOLUBILITY IN SEVERAL SOLVENTS.**

(U. S. P.; at 20°, Müller — Apoth.-Ztg. 18 258, '03; Schindelmeyer.)

Solvent.	Gms. C <sub>21</sub> H <sub>22</sub> N <sub>2</sub> O <sub>2</sub> per 100 Gms.		Solvent.	Gms. C <sub>21</sub> H <sub>22</sub> N <sub>2</sub> O <sub>2</sub> per 100 Gms.	
	Solution at 20°.	Solvent at 25°.		Solution at 20°.	Solvent at 25°.
Water	0.021	0.016	Petroleum Ether	0.0093	...
Water Sat. with Ether	0.0166	...	Acetic Ether	0.1972	...
Ether	0.0432	0.0182	Carbon Tetra Chloride	0.158	0.645 (17°) (S.)
Ether Sat. with H <sub>2</sub> O	0.0513	...	Alcohol	...	0.909
Benzene	0.770	0.666	Amyl Alcohol	...	0.555
Chloroform	100+	16.6	Glycerine	...	0.25 (15°)

100 gms. pyridine dissolve 1.24 gm. C<sub>21</sub>H<sub>22</sub>N<sub>2</sub>O<sub>2</sub> at 26°.

(Holtz — J. Physic. Chem. 9, 764, '05.)

**SOLUBILITY OF STRYCHNINE NITRATE AND SULPHATE IN SEVERAL SOLVENTS.**

(U. S. P.)

Solvent.	Strychnine Nitrate.		Strychnine Sulphate.	
	Gms. per 100 Gms. Solvent at:		Gms. per 100 Gms. Solvent at:	
	25°.	80°.	25°.	80°.
Water	2.38	12.5	3.23	16.6
Alcohol	0.83	1.66 (60°)	1.54	5.0 (60°)
Chloroform	0.64	...	0.31	...
Glycerine	1.66	4.0 (15°)	22.5 (15°)	...

**SUBERIC ACID** C<sub>6</sub>H<sub>10</sub>(COOH)<sub>2</sub>.

**SOLUBILITY IN WATER.**

(Lamoureux — Compt. rend. 128, 998, '99.)

	6°.	0°.	15°.	20°.	35°.	50°.	65°.
Gms. C <sub>6</sub> H <sub>10</sub> (COOH) <sub>2</sub> per 100 cc. solution		0.08	0.13	0.16	0.45	0.98	2.22

# SUCCINIC ACID

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## SUCCINIC ACID $(\text{CH}_2)_2(\text{COOH})_2$ .

### SOLUBILITY IN WATER.

(Miczynski — Monatsch. Chem. 7, 263, '86; Van der Stadt — Z. physik. Chem. 41, 355, '02; Lamouroux — Compt. rend. 128, 998, '99; for other concordant results, see Bourgoin — Bull. soc. chim. [2] 21, 110 '74; Henry — Compt. rend. 99, 1157, '84.)

t°.	Gms. $(\text{CH}_2)_2(\text{COOH})_2$ per 100		Gms. Succinic Anhydride $(\text{CH}_2)_2\text{COCO}$ per 100 Gms. $\text{H}_2\text{O}$ .	Mol. per cent.	
	Gms. $\text{H}_2\text{O}$ .	cc. Solution.		$\text{H}_2\text{O}$ .	$(\text{CH}_2)_2\text{COCO}$ .
0	2.80	2.78 (L.)	2.34	99.58	0.42
10	4.51	4.0	3.80	99.32	0.68
20	6.89	5.8	5.77	98.97	1.03
25	8.06	7.0	6.74	98.80	1.20
30	10.58	8.5	8.79	98.44	1.56
40	16.21	12.5	13.42	97.64	2.36
50	24.42	18.0	19.95	96.53	3.47
60	35.83	24.5	28.77	95.07	4.93
70	51.07	...	40.11	93.26	6.74
80	70.79	...	54.08	91.12	8.88
89.4	95.45	...	70.62	88.71	11.29
104.8	146.3	...	101.2	84.57	15.43
115.1	188.5	...	126.8	81.4	18.6
134.2	335.4	...	187.8	74.72	25.28
159.5	748.2	...	295.2	65.27	34.73
180.6	1839.0	...	408.5	57.6	42.4
182.8	∞	...	542.3	50.0	50.0
174.4	...	...	808.5	40.7	59.3
153.3	...	...	2239.0	19.86	80.14
128.0	...	...	8865.0	5.89	94.11
118.8-119	...	...	∞	0.00	100.00

### SOLUBILITY OF SUCCINIC ACID IN ALCOHOLS AND IN ETHER.

(Timofeiew — Compt. rend. 112, 1137, '91; at 15°, Bourgoin — Ann. chim. phys. [5] 13, 405, '78.)

Solvent.	Gms. $(\text{CH}_2)_2(\text{COOH})_2$ per 100 Gms. Solvent at:		
	-1°.	+15°.	+21.5°.
Abs. Methyl Alcohol	10.51	...	19.40
Abs. Ethyl " "	5.06	12.59	9.49
90% " "	...	7.51	...
Abs. Propyl " "	2.11	...	4.79
Abs. Ether	...	1.265	...

### DISTRIBUTION OF SUCCINIC ACID BETWEEN WATER AND AMYL ALCOHOL AT 20°.

(Herz and Fischer — Ber. 37, 4748, '04.)

Millimols $\frac{1}{2}\text{C}_4\text{H}_6\text{O}_4$ per 10 cc.		Gms. $\text{C}_4\text{H}_6\text{O}_4$ per 100 cc.		Millimols $\frac{1}{2}\text{C}_4\text{H}_6\text{O}_4$ per 10 cc.		Gms. $\text{C}_4\text{H}_6\text{O}_4$ per 100 cc.	
Alcohol Layer.	Aq. Layer.	Alcohol Layer.	Aq. Layer.	Alcohol Layer.	Aq. Layer.	Alcohol Layer.	Aq. Layer.
0.1888	0.2684	0.1114	0.1584	3.899	6.0795	2.302	3.588
0.3643	0.5252	0.215	0.310	5.199	8.099	3.069	4.779
0.7077	1.0373	0.418	0.612	6.334	10.170	3.739	6.000
1.440	2.1266	0.850	1.255	7.119	11.555	4.202	6.821
2.715	4.0495	1.603	2.391				

**SOLUBILITY OF SUCCINIC ACID IN AQUEOUS ACETONE AT 20°.**  
(Herz and Knoch — Z. anorg. Chem. 41, 320, '04.)

cc. Acetone per 100 cc. Solution.	C <sub>4</sub> H <sub>6</sub> O <sub>4</sub> per 100 cc. Solution.		cc. Acetone per 100 cc. Solution.	C <sub>4</sub> H <sub>6</sub> O <sub>4</sub> per 100 cc. Solution	
	Millimols.	Grams.		Millimols.	Grams.
0	107.8	6.363	60	275.7	16.27
10	127.4	7.519	70	278.5	16.44
20	155.8	9.194	80	265.3	15.66
30	186.7	11.02	90	201.9	11.91
40	225.4	13.30	100	51.5	3.04
50	254.3	15.01			

**SOLUBILITY OF SUCCINIC ACID IN AQUEOUS GLYCERINE  
SOLUTIONS AT 25°.**

(Herz and Knoch — Z. anorg. Chem. 45, 268, '05.)

Wt. % Glycerine in Solvent.	C <sub>4</sub> H <sub>6</sub> O <sub>4</sub> per 100 cc. Solution.		Sp. Gr. of Solutions.	Wt. % Glycerine in Solvent.	C <sub>4</sub> H <sub>6</sub> O <sub>4</sub> per 100 cc. Solution.		Sp. Gr. of Solutions.
	Millimols.	Grams.			Millimols.	Grams.	
0	133.4	7.874	1.0213	40.95	105.8	6.244	1.1120
7.15	128.2	7.566	1.0407	48.70	99.9	5.896	1.1208
20.44	118.3	6.982	1.0644	69.20	88.5	5.223	1.1804
31.55	109.7	6.476	1.0897	100.00*	74.6	4.440	1.2530

\* Sp. Gr. of Glycerine = 1.2555. Impurity about 1.5 per cent.

**SUCCINIMID**  $\text{C}_4\text{H}_4\text{N}_2 < \begin{smallmatrix} \text{CO} \\ \text{CO} \end{smallmatrix} > \text{NH}$ .

**SOLUBILITY IN WATER AND IN ETHYL ALCOHOL.**

Interpolated from original results.

(Speyers — Am. J. Sci. [4] 14, 294, '02.)

In Water.				In Ethyl Alcohol.			
t°.	Wt. of 1 cc. Solution.	Mols. per 100 Mols. H <sub>2</sub> O.	Gms. per 100 Gms. H <sub>2</sub> O.	Wt. of 1 cc. Solution.	Mols. per 100 Mols. C <sub>2</sub> H <sub>5</sub> OH.	Gms. per 10 Gms. C <sub>2</sub> H <sub>5</sub> OH	
0	1.025	1.58	8.69	0.815	0.88	1.89	
10	1.035	2.4	14.0	0.809	1.35	2.7	
20	1.052	4.0	23.0	0.806	2.00	4.1	
25	1.067	5.9	33.0	0.805	2.5	5.3	
30	1.086	8.0	45.0	0.804	3.1	6.8	
40	1.120	12.8	70.0	0.809	4.9	10.5	
50	1.145	17.8	96.0	0.816	7.8	16.0	
60	1.167	22.6	124.0	0.835	12.3	26.5	
70	1.189	27.5	152.0	0.873	...	...	
80	1.204	32.8	...	0.954	...	...	

**SUCCINIC NITRIL** (Ethylene Cyanide)  $\text{CNCH}_2\text{CH}_2\text{CN}$ .

The solubility of succinic nitril in water and also in aqueous sodium chloride solutions at various temperatures has been determined by Schreinemaker (Z. physik. Chem. 23, 439, '97), and the results presented in terms of mols. of nitril per 100 mols. of nitril + H<sub>2</sub>O. The following calculation of these results to gram quantities was made by Rothmund.

(Landolt and Börnstein, 3d ed. p. 596, '06.)

t°.	Gms. CNCH <sub>2</sub> CH <sub>2</sub> CN per 100 Gms.		t°.	Gms. CNCH <sub>2</sub> CH <sub>2</sub> CN per 100 Gms.	
	Aq. Layer.	Nitril Layer.		Aq. Layer.	Nitril Layer.
18.5	10.2	92.0	53.5	33.2	66.4
20	11.0	91.5	55	40.3	62.8
39	...	85.2	55.4 (crit. temp.)	51.0	
45	22.0	...			



## SUGAR

324

SUGAR  $C_{12}H_{22}O_{11}$  (Cane Sugar.)

## SOLUBILITY IN WATER.

(Herzfeld — Z. Ver. Zuckerind. 181, '92; see also Courtonne — Ann. chim. phys. [5] 12, 569, '77.)

t°.	Gms. $C_{12}H_{22}O_{11}$ per 100 Gms.		t°.	Gms. $C_{12}H_{22}O_{11}$ per 100 Gms.	
	Solution.	Water.		Solution.	Water.
0	64.18	179.2	40	70.42	238.1
5	64.87	184.7	45	71.32	248.7
10	65.58	190.5	50	72.25	260.4
15	66.33	197.0	60	74.18	287.3
20	67.09	203.9	70	76.22	320.4
25	67.89	211.4	80	78.36	362.1
30	68.70	219.5	90	80.61	415.7
35	69.55	228.4	100	82.97	487.2

Sp. Gr. of sat. solution at 15° = 1.329; at 25° = 1.340.

## SOLUBILITY OF SUGAR IN AQUEOUS SALT SOLUTIONS AT 30°, 50°, AND 70°.

Interpolated from original results.

(Schukow — Z. Ver. Zuckerind. 50, 313, '00.)

t°.	Gms. Salt per 100 Gms. $H_2O$ .	Gms. $C_{12}H_{22}O_{11}$ per 100 grams $H_2O$ in Aq. Solution of:				
		KCl.	KBr.	$KNO_3$ .	NaCl.	$CaCl_2$ .
30	0	219.5	219.5	219.5	219.5	219.5
"	10	216	218	217	210	197
"	20	221	220	216	211	189
"	30	228	224	216	219	192
"	40	237	228	217	233	200
"	50	...	...	218	250	218
"	60	...	...	...	269	243
50	0	260.4	260.4	260.4	260.4	260.4
"	10	261	262	260	255	239
"	20	266	266	261	260	228
"	30	274	272	262	269	228
"	40	284	276	262	284	236
"	50	296	280	263	302	253
"	60	...	...	...	...	276
70	0	320.5	320.5	320.5	320.5	320.5
"	10	326	324	321	323	295
"	20	334	328	324	330	286
"	30	345	334	327	344	286
"	40	357	341	331	361	295
"	50	370	349	334	384	308
"	60	384	357	337	406	327

**SOLUBILITY OF CANE SUGAR IN SATURATED AQUEOUS SALT  
SOLUTIONS AT 31.25°.**

(Köhler — Z. Ver. Zuckerind. 47, 447, '97.)

Salt.	Gms. Sugar per 100 Gms.		Salt.	Gms. Sugar per 100 Gms.	
	Solution.	Water.		Solution.	Water.
CH <sub>3</sub> COOK	...	324.8	Na <sub>2</sub> CO <sub>3</sub>	64.73	229.2
C <sub>2</sub> H <sub>5</sub> COOK	49.19	306.1	KNO <sub>3</sub>	61.36	224.7
C <sub>2</sub> H <sub>5</sub> .OH.(COOK) <sub>3</sub>	50.30	303.9	K <sub>2</sub> SO <sub>4</sub>	66.74	219.0
K <sub>2</sub> CO <sub>3</sub>	56.0	265.4	CH <sub>3</sub> COOCa	60.12	190.0
KCl	62.28	246.5	Na <sub>2</sub> SO <sub>4</sub>	52.20	183.7
CH <sub>3</sub> COONa	59.93	237.6	CaCl <sub>2</sub>	42.84	135.1
NaCl	62.17	236.3	MgSO <sub>4</sub>	46.52	119.6

**SOLUBILITY OF CANE SUGAR IN AQUEOUS ALCOHOL SOLUTIONS.**

(Scheibler — Ber. 5, 343, '72; correction Ber. 24, 434, '91.)

Per cent Alcohol by Vol.	Results at 0°.		Results at 14°.				Results at 40°.
	Sp. Gr. of Solution at 17.5°.	Gms. Sugar per 100 cc. Solution.	Sp. Gr. of Solution at 17.5°.	Gms. per 100 cc. Solution.			Gms. Sugar per 100 cc. Solution.
				Sugar.	C <sub>2</sub> H <sub>5</sub> OH.	H <sub>2</sub> O.	
0	1.325	85.8	1.326	87.5	0	45.10	...
10	1.299	80.7	1.300	81.5	3.91	44.82	95.4
20	1.236	74.2	1.266	74.5	8.52	43.83	90.0
30	1.229	65.5	1.233	67.9	13.74	41.87	82.2
40	1.182	56.7	1.185	58.0	20.24	40.38	74.9
50	1.129	45.9	1.131	47.1	28.13	38.02	63.4
60	1.050	32.9	1.058	33.9	37.64	34.47	49.9
70	0.972	18.2	0.975	18.8	46.28	29.57	31.4
80	0.893	6.4	0.895	6.6	61.15	21.95	13.3
90	0.837	0.7	0.838	0.9	71.18	12.83	2.3
97.4	0.806	0.08	0.808	0.36	77.39	3.28	0.5

**SOLUBILITY OF CANE SUGAR IN AQUEOUS ALCOHOL SOLUTIONS AT 14°.**

(Schrefeld — Z. Ver. Zuckerind. 44, '971 '94.)

Wt. per cent Alcohol.	Wt. per cent Sugar.	Gms. Sugar per 100 cc. Alcohol-H <sub>2</sub> O Mixture.	Wt. per cent Alcohol.	Wt. per cent Sugar.	Gms. Sugar per 100 cc. Alcohol-H <sub>2</sub> O Mixture.
0	66.2	195.8	50	38.55	62.7
5	64.25	179.7	60	26.70	36.4
10	62.20	164.5	70	12.25	13.9
20	58.55	141.2	80	4.05	4.2
30	54.05	117.8	90	0.95	0.9
40	47.75	91.3	100	0.00	0.0

100 gms. absolute methyl alcohol dissolve 1.18 gms. sugar at 19°.

(de Bruyn — Z. physik. Chem. 10, 784, '92.)

**SOLUBILITY OF SUGARS IN PYRIDINE AT 26°.**

(Holtz — J. Physic. Chem. 9, 764, '04.)

Sugar.	Formula.	Gms. Sugar per 100 Gms. Solution.	Sp. Gr. of Solutions.
Cane Sugar	C <sub>12</sub> H <sub>22</sub> O <sub>11</sub>	6.45	...
Milk Sugar	C <sub>12</sub> H <sub>22</sub> O <sub>11</sub> .H <sub>2</sub> O	2.18	0.9811
Grape Sugar	C <sub>6</sub> H <sub>12</sub> O <sub>6</sub> .H <sub>2</sub> O	7.62	1.0521

## SOLUBILITY OF CANE SUGAR IN AQUEOUS ACETONE AT 25°.

(Herz and Knoch — Z. anorg. Chem. 41, 322, '04.)

Sp. Gr. of Solutions.	cc. Acetone per 100 cc. Solvent.	Gms. Sugar per 100 cc. Solution.	Gms. per 100 cc. Solution.		
			H <sub>2</sub> O.	(CH <sub>3</sub> ) <sub>2</sub> CO.	C <sub>12</sub> H <sub>22</sub> O <sub>11</sub> .
1.3306	0.0	89.8	43.3	0.0	89.8
1.2796	20.0	76.7	42.9	8.4	76.7
1.2491	30.0	72.1	39.5	13.4	72.1
1.2002	40.0	59.3	39.8	20.9	59.3
1.1613	45.0	52.5	39.0	24.6	52.5

Above 45 cc. acetone per 100 cc. solvent the solution begins to separate into two layers. The lower of these contains 51 gms. sugar per 100 cc. and has Sp. Gr. 1.1522. The upper layer contains so little sugar that the amount could not be determined by the method employed. 100 cc. evaporated in a vacuum desiccator left a residue of 3.68 gms. Above the concentration of 80 cc. acetone per 100 cc. solvent the two layers unite. In pure acetone 100 cc. solution give a residue of 0.18 gram sugar.

## SOLUBILITY OF GRAPE SUGAR IN WATER AND IN AQ. ALCOHOL.

100 gms. H<sub>2</sub>O dissolve 81.68 gms. C<sub>6</sub>H<sub>12</sub>O<sub>6</sub> or 97.85 gms. C<sub>6</sub>H<sub>11</sub>O<sub>6</sub>.H<sub>2</sub>O at 15°.

100 gms. aq. alcohol of 0.837 Sp. Gr. = 85 wt. per cent dissolve 1.95 gms. C<sub>6</sub>H<sub>12</sub>O<sub>6</sub> at 17.5°.

100 gms. aq. alcohol of 0.880 Sp. Gr. = 66 wt. per cent dissolve 8.10 gms. C<sub>6</sub>H<sub>12</sub>O<sub>6</sub> at 17.5°.

100 gms. aq. alcohol of 0.910 Sp. Gr. = 53 wt. per cent dissolve 16.01 gms. C<sub>6</sub>H<sub>12</sub>O<sub>6</sub> at 17.5°.

100 gms. aq. alcohol of 0.915 Sp. Gr. = 51 wt. per cent dissolve 32.50 gms. C<sub>6</sub>H<sub>12</sub>O<sub>6</sub> at 17.5°.

## SOLUBILITY OF MILK SUGAR IN WATER AND IN ABSOLUTE METHYL ALCOHOL.

100 gms. H<sub>2</sub>O dissolve 17.03 gms. C<sub>12</sub>H<sub>22</sub>O<sub>11</sub>.H<sub>2</sub>O at 10°, 20.8 gms. at 25° (U. S. P.), 40 gms. at 100°, and 100 gms. at b. pt.

100 gms. abs. methyl alcohol dissolve 0.084 gm. at 19.5°.

(de Bruyn — Z. physik. Chem. 10, 784, '92.)

SULPHANILIC ACID NH<sub>2</sub>.C<sub>6</sub>H<sub>4</sub>SO<sub>3</sub>H.

## SOLUBILITY IN WATER.

(Dolinski — Ber. 38, 1836, '05.)

t°.	Gms. Acid per 100 Gms.		t°.	Gms. Acid per 100 Gms.	
	Solution.	Water.		Solution.	Water.
0	0.64	0.64	60	3.01	3.10
10	0.83	0.84	70	3.65	3.78
20	1.07	1.08	80	4.32	4.51
30	1.47	1.49	90	5.25	5.54
40	1.94	1.97	100	6.26	6.67
50	2.44	2.51			

## SULPHUR S.

## SOLUBILITY IN:

Tin Tetra Chloride.  
(Gerardin — Ann. chim. phys. [4] 5, 134, '65.)

t°.	Gms. S per 100 Gms. SnCl <sub>4</sub> .	Solid Phase.
99	5.8	Solid S
101	6.2	"
110	8.7-9.1	"
112	9.4-9.9	Liquid S
121	17.0	"

Amyl Alcohol.  
(Gerardin.)

t°.	Gms. S per 100 Gms. C <sub>5</sub> H <sub>11</sub> OH.	Solid Phase.
95	1.5	Solid S
110	2.1-2.2	"
112	2.6-2.7	Liquid S
120	3.0	"
131	5.3	"

## SOLUBILITY OF SULPHUR IN ETHYL AND METHYL ALCOHOLS.

t°.	Alcohol.	Gms. per 100 Gms. Alcohol.	Authority.
15	Abs. Ethyl	0.051	(Pohl.)
18.5	"	0.053	(de Bruyn — Z. physik. Chem. 10, 781, '92.)
b. pt.	"	0.42	(Payen — Compt. rend. 34, 356, '52.)
18.5	Abs. Methyl	0.028	(de Bruyn.)

## SOLUBILITY OF SULPHUR IN AQUEOUS ACETONE AT 25°.

(Herz and Knoch — Z. anorg. Chem. 45, 263, '05.)

Wt. per cent Acetone in Solvent.	Sulphur per 100 cc. Solution.		Sp. Gr. of Solution.
	Millimols.	Grams.	
100	65.0	2.084	0.7854
95.36	45.0	1.442	0.7911
90.62	33.0	1.058	0.8165
85.38	25.3	0.811	0.8295

## SOLUBILITY OF SULPHUR IN BENZENE AND IN ETHYLENE DI BROMIDE.

(Etard — Ann. chim. phys. [7] 2, 571, '94; see also Cossa — Ber. 1, 139, '68.)

In C <sub>6</sub> H <sub>6</sub> .				In C <sub>2</sub> H <sub>4</sub> Br <sub>2</sub> .			
t°.	Gms. S per 100 Gms. Solution.	t°.	Gms. S per 100 Gms. Solution.	t°.	Gms. S per 100 Gms. Solution.	t°.	Gms. S per 100 Gms. Solution.
0	1.0	70	8.0	0	1.2	50	6.4
10	1.3	80	10.5	10	1.7	60	8.4
20	1.7	90	13.8	20	2.3	70	11.4
25	2.1	100	17.5	25	2.8	80	16.5
30	2.4	110	23.0	30	3.3	90	24.0
40	3.2	120	29.0	40	4.4	100	36.5
50	4.3	130	36.0				
60	6.0						

100 gms. sat. solution of S in benzoyl chloride, C<sub>7</sub>H<sub>7</sub>Cl, contain 1 gram S at 0° and 55.8 gms. at 134°.

(Bogousky — J. Soc. Phys. Chim. R. 37, 92, '05.)

## SOLUBILITY OF SULPHUR IN CARBON BISULPHIDE.

(Etard — Ann. chim. phys. [7] 2, 571, '94; Cossa — Ber. 1, 138, '65; at 10°, Retgers — Z. anorg. Chem. 3, 347, '93; below — 77°, Arctowski — *Ibid.* 11, 274, '95-96.)

t°.	Gms. S per 100 Gms.		t°.	Gms. S per 100 Gms.		t°.	Gms. S per 100 Gms.	
	Solution.	CS <sub>2</sub>		Solution.	CS <sub>2</sub>		Solution.	CS <sub>2</sub>
-110	3.0	3.1	-10	13.5	15.6	50	59.0	143.9
-100	3.5	3.6	0	18.0	22.0	60	66.0	194.1
-80	4.0	4.2	10	23.0*	29.9	70	72.0	257.1
-60	3.5	3.6	20	29.5	41.8	80	79.0	376.1
-40	6.0	6.4	25	33.5	50.4	90	86.0	614.1
-20	10.5	11.7	30	38.0	61.3	100	92.0	1150.0
			40	50.0	100.0			

\* 26.4 R.

Sp. Gr. of solution saturated at 15° containing 26 gms. S per 100 gms. solution = 1.372.

SOLUBILITY OF SULPHUR IN HEXANE (C<sub>6</sub>H<sub>14</sub>).

(Etard.)

t°.	Gms. S per 100 Gms. Solution.	t°.	Gms. S per 100 Gms. Solution.	t°.	Gms. S per 100 Gms. Solution.
-20	0.07	60	1.0	130	5.2
0	0.16	80	1.7	140	6.0
20	0.25	100	2.8	160	7.2
40	0.55	120	4.4	180	8.2

## SOLUBILITY OF SULPHUR IN SEVERAL SOLVENTS.

(Cossa — Ber. 1, 139, '68; Retgers; Cap and Garot — J. pharm. chim. [3] 26, 81 '54; Kleven — Chem. Centralb. 434, '72.)

Solvent.	t°.	Gms. S per 100 Gms. Solvent.	Solvent.	t°.	Gms. S per 100 Gms. Solvent.
C <sub>6</sub> H <sub>5</sub> NH <sub>2</sub>	130	85.3	C <sub>6</sub> H <sub>5</sub> CH <sub>3</sub>	230	1.48
CHCl <sub>3</sub>	22	1.21	CH <sub>2</sub> I <sub>2</sub>	10	10.0 (R.)
(C <sub>2</sub> H <sub>5</sub> ) <sub>2</sub> O	23.5	0.97	C <sub>10</sub> H <sub>4</sub> N <sub>2</sub> *	100	10.58
C <sub>6</sub> H <sub>5</sub> OH	174	16.35	C <sub>6</sub> H <sub>3</sub> (OH) <sub>3</sub>	ord. t.	0.05-0.1 (C. and G.)

\* Nicotine.

## SOLUBILITY OF SULPHUR IN COAL TAR OIL, LINSEED OIL AND IN OLIVE OIL.

(Pelouze — Compt. rend. 68, 1179, '69; 69, 56, '69; Pohl.)

Grams S per 100 Grams Coal Tar Oil of:							G. S per 100 Gms.	
t°.	Sp. Gr.: b. pt.: 80°-100°.	0.87 85°-120°.	0.88 120°-220°.	0.885 150°-200°.	1.01 210°-300°.	1.02 220°-300°.	Linseed Oil.	Olive Oil of 0.885 Sp. Gr.
15	2.1	2.3	2.5	2.6	6.0	7.0	0.4	2.3
30	3.0	4.0	5.3	5.8	8.5	8.5	0.6	4.3
50	5.2	6.1	8.3	8.7	10.0	12.0	1.2	9.0
80	11.8	13.7	15.2	21.0	37.0	41.0	2.2	18.0
100	15.2	18.7	23.0	26.4	52.5	54.0	3.0	25.0
110	...	23.0	26.2	31.0	105.0	115.0	3.5	30.0
120	...	27.0	32.0	38.0	∞	∞	4.2	37.0
130	...	...	38.7	43.8	∞	∞	5.0	43.0
							(160°)	10.0

100 gms. oil of turpentine dissolve 1.35 gms. S at 16°, and 16.2 gms. at b. pt.

(Payen — Compt. rend. 34, 356, '52.)

SULPHUR DIOXIDE  $\text{SO}_2$ .

## SOLUBILITY IN WATER.

(Schönfeld — Liebig's Ann. 95, 5 '55; Sims — *Ibid.* 118, 340, '61; Roozeboom — Rec. trav. chim. 3, 46, '84.)

Schönfeld.				Sims.			Roozeboom.	
t°.	Vols. $\text{SO}_2$ (at 0° and 760 mm.) per 1 Vol.		Gms. $\text{SO}_2$ per 100 Gms. $\text{H}_2\text{O}$ at total pressure 760 mm.	t°.	$\text{SO}_2$ per 1 Gm. $\text{H}_2\text{O}$ .		t°.	$\text{SO}_2$ Dissolved per 1 pt. $\text{H}_2\text{O}$ at 760 mm. pressure.
	Sat. $\text{SO}_2$ + Aq.	$\text{H}_2\text{O}$ .			Gms.	Vols.		
0	68.86	79.79	22.83	8	0.168	58.7	0	0.236
5	59.82	67.48	19.31	10	0.154	53.9	2	0.218
10	51.38	56.65	16.21	14	0.130	45.6	4	0.201
15	43.56	47.28	13.54	20	0.104	36.4	6	0.184
20	36.21	39.37	11.29	26	0.087	30.5	7	0.176
25	30.77	32.79	9.41	30	0.078	27.3	8	0.168
30	25.82	27.16	7.81	36	0.065	22.8	10	0.154
35	21.23	22.49	...	40	0.058	20.4		
40	17.01	18.77	5.41	46	0.050	17.4	12	0.142
				50	0.045	15.6		

Sp. Gr. of sat. solution at 0° = 1.061; at 10°, 1.055; at 20° = 1.024.  
 1 gm.  $\text{H}_2\text{O}$  dissolves 0.0909 gm.  $\text{SO}_2$  = 34.73 cc. (measured at 25°)  
 at 25° and 748 mm. pressure.

(Walden and Centnerswer — Z. physik. Chem. 42, 462, '01-'02.)

SOLUBILITY OF SULPHUR DIOXIDE IN SULPHURIC ACID OF  
1.84 SP. GR.

Interpolated from original results.

(Dunn — Chem. News, 45, 272, '82.)

t°.	Sp. Gr. of Sat. Solution.	Coefficient of Absorption (760 mm.).	t°.	Sp. Gr. of Sat. Solution.	Coefficient of Absorption (760 mm.).
0	...	53.0	50	1.8186	9.5
10	1.8232	35.0	60	1.8165	7.0
20	1.8225	25.0	70	1.8140	5.5
25	1.8221	21.0	80	1.8112	4.5
30	1.8216	18.0	90	1.8080	4.0
40	1.8205	13.0			

## SOLUBILITY OF SULPHUR DIOXIDE IN AQUEOUS SULPHURIC ACID SOLUTIONS.

(Dunn; see also Kolb — Bull. soc. ind. Mulhouse — 222, '72.)

t°.	Sp. Gr. of $\text{H}_2\text{SO}_4$ Solution.	Approximate Per cent $\text{H}_2\text{SO}_4$ .	Coefficient of Absorption.	t°.	Sp. Gr. of $\text{H}_2\text{SO}_4$ Solution.	Approximate per cent $\text{H}_2\text{SO}_4$ .	Coefficient of Absorption
6.9	1.139	20	48.67	15.2	1.173	25	31.82
6.9	1.300	40	45.38	16.8	1.151	21	31.56
8.6	1.482	58	39.91	14.8	1.277	36	30.41
9.8	1.703	78	29.03	15.1	1.458	56	29.87
5.5	1.067	10	36.78	15.6	1.609	70	25.17
6.0	1.102	15	3.408	15.0	1.739	81	20.83

For Coefficient of Absorption, see Ethane page 133.

## SOLUBILITY OF SULPHUR DIOXIDE IN AQUEOUS SALT SOLUTIONS.

(Fox — Z. physik. Chem. 41, 461, '02.)

Results in terms of the Ostwald Solubility Expression. See page 105.

Aqueous Salt Solution.	Solubility Coefficient $l$ of $\text{SO}_2$ in aq. Solutions of Concentrations:					
	0.5 Normal	1.0 N.	1.5 N.	2.0 N.	2.5 N.	3.0 N.
$\text{NH}_4\text{Cl}$	$l_{25}=34.58$	36.37	38.06	39.76	41.37	42.78
$\text{NH}_4\text{Br}$	$l_{25}=36.25$	39.46	42.78	46.06	49.17	52.25
$\text{NH}_4\text{CNS}$	$l_{25}=37.78$	42.74	47.26	52.26	57.01	61.46
$\text{NH}_4\text{NO}_3$	$l_{25}=33.96$	35.07	36.28	37.27	38.01	39.14
$\text{NH}_4\text{NO}_2$	$l_{25}=23.35$	24.23	24.78	25.57	26.66	27.43
$(\text{NH}_4)_2\text{SO}_4$	$l_{25}=33.35$	33.82	34.33	34.95	35.47	35.96
$(\text{NH}_4)_2\text{SO}_4$	$l_{35}=22.91$	23.14	23.49	23.93	24.23	24.60
$\text{CdCl}_2$	$l_{25}=31.66$	30.55	29.46	28.16	27.09	26.06
$\text{CdCl}_2$	$l_{35}=21.73$	21.23	20.55	20.02	19.23	18.68
$\text{CdBr}_2$	$l_{25}=31.91$	31.01	30.17	29.27	28.15	27.46
$\text{CdBr}_2$	$l_{35}=21.88$	21.46	20.81	20.60	19.70	19.17
$\text{CdI}_2$	$l_{25}=33.27$	33.76	34.16	34.74	34.98	35.77
$\text{CdI}_2$	$l_{35}=22.75$	23.06	23.36	23.71	23.99	24.30
$\text{CdSO}_4$	$l_{25}=31.11$	29.71	28.24	26.58	25.14	23.76
$\text{CdSO}_4$	$l_{35}=21.45$	20.43	19.42	18.31	17.41	16.25
$\text{KCl}$	$l_{25}=34.42$	36.05	37.76	39.32	40.96	42.27
$\text{KCl}$	$l_{35}=23.74$	25.15	26.54	27.94	28.93	30.02
$\text{KBr}$	$l_{25}=35.94$	39.11	42.41	44.96	48.87	52.26
$\text{KBr}$	$l_{35}=24.83$	27.49	29.64	31.93	34.12	36.14
$\text{KCNS}$	$l_{25}=37.57$	42.38	47.02	51.81	55.87	61.26
$\text{KCNS}$	$l_{35}=25.63$	28.79	32.03	35.05	38.13	42.94
$\text{KI}$	$l_{25}=38.66$	44.76	50.58	56.75	62.63	68.36
$\text{KI}$	$l_{35}=26.30$	30.25	34.64	38.04	41.87	45.43
$\text{KNO}_3$	$l_{25}=33.80$	34.79	35.77	36.66	37.57	38.52
$\text{KNO}_3$	$l_{35}=23.27$	24.03	24.79	25.72	26.54	27.33
$\text{K}_2\text{SO}_4$	$l_{25}=33.20$	33.61	...	...	...	...
$\text{NaBr}$	$l_{25}=33.76$	34.54	35.27	36.26	36.84	37.74
$\text{NaCl}$	$l_{25}=32.46$	32.25	31.96	31.76	31.51	31.36
$\text{NaCNS}$	$l_{25}=35.44$	38.24	40.78	43.37	45.86	48.34
$\text{Na}_2\text{SO}_4$	$l_{25}=31.96$	31.14	30.45	29.51	28.66	28.44
$\text{Na}_2\text{SO}_4$	$l_{35}=21.88$	21.35	20.81	20.21	19.75	19.27

## SOLUBILITY OF SULPHUR DIOXIDE IN ALCOHOLS AND IN OTHER SOLVENTS.

(de Bruyn — Rec. trav. chim. 11, 128, '92; Schulze — J. pr. Chem. [2] 24, 168, '81.)

t°.	In Ethyl Alcohol at 760 mm.		In Methyl Alcohol at 760 mm.		In Several Solvents at 0° and 725 mm. (S.)		
	Gms. $\text{SO}_2$ per 100 Gms. Solution. $\text{C}_2\text{H}_5\text{OH}$ .		Gms. $\text{SO}_2$ per 100 Gms. Solution. $\text{CH}_3\text{OH}$ .		Solvent.	$\text{SO}_2$ per 1 Gm. Solvent.	
0	53.5	115.0	71.1	246.0	Camphor	0.880	308
7	45.0	81.0	59.9	149.4	$\text{CH}_3\text{COOH}$	0.961	318
12.3	39.9	66.4	52.2	109.2	$\text{HCOOH}$	0.821	351
18.2	32.8	48.8	(17.8°) 44.0	78.6	$(\text{CH}_3)_2\text{CO}$	2.07	589
26.0	24.4	32.3	31.7	46.4	$\text{SO}_2\text{Cl}_2$	0.323	189

**DISTRIBUTION OF SULPHUR DIOXIDE AT 20° BETWEEN:**  
(McCrae and Wilson — Z. anorg. Chem. 35, 11, '03.)

Water and Chloroform.				Conc. of HCl.	Aq. HCl and Chloroform.			
Gms. SO <sub>2</sub> per Liter in:		Gm. Equiv. $\frac{1}{2}$ SO <sub>2</sub> per Liter in:			Gms. SO <sub>2</sub> per Liter in:		Gm. Equiv. $\frac{1}{2}$ SO <sub>2</sub> per Liter in:	
Aq. Layer.	CHCl <sub>3</sub> Layer.	Aq. Layer.	CHCl <sub>3</sub> Layer.		Aq. Layer.	CHCl <sub>3</sub> Layer.	Aq. Layer.	CHCl <sub>3</sub> Layer.
1.738	1.123	0.0543	0.0351	0.05	1.86	1.46	0.0581	0.0456
1.753	1.122	0.0547	0.0350	"	3.07	2.83	0.0960	0.0884
2.346	1.703	0.0732	0.0532	"	4.28	4.07	0.1336	0.1271
2.628	1.897	0.0821	0.0592	"	5.34	5.42	0.1667	0.1692
3.058	2.385	0.0955	0.0745	0.10	1.25	1.41	0.039	0.044
3.735	3.062	0.1166	0.0956	"	2.78	3.08	0.0868	0.0962
4.226	3.626	0.1319	0.1132	"	3.86	4.08	0.1199	0.1275
5.269	4.798	0.1645	0.1498	"	5.161	5.72	0.1612	0.1784
6.588	6.183	0.2057	0.1930	0.2	1.268	1.51	0.0396	0.0471
31.92	33.84	0.9968	1.056	"	1.914	2.27	0.0597	0.0710
33.26	37.25	1.038	1.163	"	2.464	3.04	0.0769	0.0949
				"	3.967	4.90	0.1239	0.1530
				0.4	1.202	1.61	0.038	0.0504
				"	1.894	2.26	0.059	0.0706

**TANNIC ACID** C<sub>12</sub>H<sub>8</sub>O<sub>7</sub>COOH.

100 gms. H<sub>2</sub>O dissolve about 294 gms. at 25°; 100 gms. alcohol dissolve about 439 gms. at 25°. (U. S. P.)

**TARTARIC ACID** C<sub>2</sub>H<sub>2</sub>(OH)<sub>2</sub>(COOH)<sub>2</sub>.

**SOLUBILITY IN WATER.**

(Leidie — Compt. rend. 95, 87, '82.)

°.	Grams Tartaric Acid per 100 Gms. H <sub>2</sub> O.			°.	Gms. Tartaric Acid per 100 Gms. H <sub>2</sub> O.		
	Dextro and Laevo Acids.	Racemic Ac. Anhydrous.	Racemic Ac. Hydrated.		Dextro and Laevo Acids.	Racemic Ac. Anhydrous.	Racemic Ac. Hydrated.
0	115.04	8.16	9.23	50	195.0	50.0	59.54
10	125.72	12.32	14.00	60	217.55	64.52	78.33
20	139.44	18.0	20.60	70	243.66	80.56	99.88
25	147.44	21.4	24.61	80	273.33	98.12	124.56
30	156.2	25.2	29.10	90	306.56	117.20	152.74
40	176.0	37.0	43.32	100	343.35	137.80	184.91

**SOLUBILITY OF TARTARIC ACID IN ALCOHOL AND IN ETHER  
AT 15°.**

(Bourgoin — Ann. chim. phys. [5] 13, 405, '78.)

Solvent.	Gms. Tartaric Acid per 100 Gms.	
	Sat. Solution.	Solvent.
Absolute Alcohol	20.385	41.135
90% Alcohol	29.146	25.604
Absolute Ether	0.389	0.40

**TELLURIUM** Te.

100 gms. methylene iodide CH<sub>2</sub>I<sub>2</sub> dissolve 0.1 gm. Te at 12°.

(Retgers — Z. anorg. Chem. 3, 340, '93.)



# TELLURIC ACID

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## TELLURIC ACID $\text{H}_2\text{TeO}_4 \cdot 2\text{H}_2\text{O}$ .

### SOLUBILITY IN WATER.

(Mylius — Ber. 34, 2208, '01.)

t°.	Gms. $\text{H}_2\text{TeO}_4$ per 100 Gms. Sol.	Mols $\text{H}_2\text{TeO}_4$ per 100 Mols. $\text{H}_2\text{O}$ .	Solid Phase.	t°.	Gms. $\text{H}_2\text{TeO}_4$ per 100 Gms. Sol.	Mols. $\text{H}_2\text{TeO}_4$ per 100 Mols. $\text{H}_2\text{O}$ .	Solid Phase.
0	13.92	1.51	$\text{H}_2\text{TeO}_4 \cdot 6\text{H}_2\text{O}$	30	33.36	4.67	$\text{H}_2\text{TeO}_4 \cdot 2\text{H}_2\text{O}$
5	17.84	2.03	"	40	36.38	5.33	"
10	26.21	3.31	"	60	43.67	7.04	"
15	32.79	4.41	"	80	51.55	9.93	"
10	25.29	3.15	$\text{H}_2\text{TeO}_4 \cdot 2\text{H}_2\text{O}$	100	60.84	14.52	"
18	28.90	3.82	"	110	67.0	19.0	"

## TELLURIUM DOUBLE SALTS

### SOLUBILITY OF TELLURIUM DOUBLE BROMIDES AND CHLORIDES IN AQUEOUS HYDROCHLORIC AND HYDROBROMIC ACIDS AT 22°.

(Wheeler — Z. anorg. Chem. 3, 432, '93.)

Tellurium Double Salt.	Formula.	Solvent.	Gms. Double Salt per 100 Gms. Solvent	
			of 1.49 Sp. Gr.	of 1.08 Sp. Gr.
Te Caesium Bromide	$\text{TeBr}_{4.2}\text{CsBr}$	Aq. HBr	0.02	0.13
Te Potassium Bromide	$\text{TeBr}_{4.2}\text{KBr}$	"	6.57	62.90
Te Rubidium Bromide	$\text{TeBr}_{4.2}\text{RbBr}$	"	0.25	3.88
Te Caesium Chloride	$\text{TeCl}_{4.2}\text{CsCl}$	Aq. HCl*	0.05	0.78
Te Rubidium Chloride	$\text{TeCl}_{4.2}\text{RbCl}$	"	0.34	13.09

\* Sp. Gr. of Aq. HCl solutions 1.2 and 1.05 respectively.

## THALLIUM ALUMS

### SOLUBILITY IN WATER AT 25°

(Locke — Am. Ch. J. 26, 174, '01.)

Alum.	Formula.	Salt per 100 Grams $\text{H}_2\text{O}$ .		
		Gms. Anhydrous.	Gms. Hydrated.	Gm. Mols.
Tl Aluminum Alum	$\text{TlAl}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$	7.5	11.78	0.0177
Tl Vanadium Alum	$\text{TlV}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$	25.6	43.31	0.0573
Tl Chromium Alum	$\text{TlCr}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$	10.48	16.38	0.0212
Tl Iron Alum	$\text{TlFe}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$	36.15	64.6	0.0799

## THALLIUM BROMATE $\text{TlBrO}_3$

One liter saturated aqueous solution contains 3.463 gms.  $\text{TlBrO}_3$  at 10.96° (B.), and 7.355 gms. at 39.75° (N. and A.).

(Böttger — Z. physik. Chem. 46, 602, '03; Noyes and Abbott — *Ibid.* 16, 132, '95.)

## THALLIUM BROMIDE $\text{TlBr}$

One liter saturated aqueous solution contains 0.42 gm.  $\text{TlBr}$  at 18°, 0.476 gm. at 20°, 0.57 gm. at 25°, and 2.467 gms. at 68.5°.

(Kohlrausch — Z. physik. Chem. 50, 356, '04; Noyes — *Ibid.* 6, 248, '90; Böttger.)

### SOLUBILITY OF $\text{TlBr}$ IN AQ. SOLUTIONS OF $\text{TlNO}_3$ AT 68.5°. (Noyes.)

Gram Molecules per Liter.		Grams per Liter.	
0.0163 $\text{TlNO}_3$	0.00410 $\text{TlBr}$	4.336 $\text{TlNO}_3$	1.164 $\text{TlBr}$
0.0294 "	0.00289 "	7.820 "	0.821 "
0.0955 "	0.00148 "	25.400 "	0.420 "

## THALLIUM CARBONATE AND THALLIUM (Per) CHLORATE.

THALLIUM CHLORATE  $\text{TlClO}_3$ .

(See p. 338.)

## SOLUBILITY IN WATER.

(Muir — J. Chem. Soc. 29, 857, '76.)

$t^\circ$	$0^\circ$	$20^\circ$	$50^\circ$	$80^\circ$	$100^\circ$
Gms. $\text{TlClO}_3$ per 100 gms. $\text{H}_2\text{O}$	2.80	3.92	12.67	36.65	57.31

SOLUBILITY OF MIXED CRYSTALS OF THALLIUM CHLORATE AND POTASSIUM CHLORATE IN WATER AT  $10^\circ$ .

(Roozeboom — Z. physik. Chem. 8, 532, '91.)

NOTE. — Solutions of the two salts were mixed in different proportions and allowed to crystallize, such amounts being taken that not more than one or two grams would separate from one liter.

Grams per 1000 cc. Solution.		Mg. Mols. per 1000 cc. Solution.		Sp. Gr. of Solutions.	Mol. per cent $\text{KClO}_3$ in Mixed Crystals.
$\text{TlClO}_3$ .	$\text{KClO}_3$ .	$\text{TlClO}_3$ .	$\text{KClO}_3$ .		
25.637	...	89.14	...	1.0210	0
19.637	6.884	68.27	56.15	1.0222	2.0
12.001	26.100	41.73	212.89	1.0278	12.61
9.036	40.064	31.42	326.79	1.0338	25.01
7.885	46.497	27.42	379.26	1.0359	36.30-97.93
7.935	46.535	27.60	379.57	1.0360	
6.706	46.410	23.32	378.55	1.0357	99.28
6.729	47.109	23.37	384.25	1.0363	99.60
4.858	47.312	16.89	385.91	1.0345	99.62
2.769	47.134	9.63	384.46	1.0330	99.67
...	49.925	...	407.22	1.0330	100.00

## SOLUBILITY OF MIXED CRYSTALS OF THALLIUM CHLORATE AND POTASSIUM CHLORATE IN WATER AT DIFFERENT TEMPERATURES.

(Quoted by Rabe — Z. anorg. Chem. 31, 156, '02.)

100 gms.  $\text{H}_2\text{O}$  dissolve 2.8 gms.  $\text{TlClO}_3$  + 3.3 gms.  $\text{KClO}_3$  at  $0^\circ$ .  
 100 gms.  $\text{H}_2\text{O}$  dissolve 10.0 gms.  $\text{TlClO}_3$  + 1.5 gms.  $\text{KClO}_3$  at  $15^\circ$ .  
 100 gms.  $\text{H}_2\text{O}$  dissolve 12.67 gms.  $\text{TlClO}_3$  + 16.2 gms.  $\text{KClO}_3$  at  $50^\circ$ .  
 100 gms.  $\text{H}_2\text{O}$  dissolve 57.3 gms.  $\text{TlClO}_3$  + 48.2 gms.  $\text{KClO}_3$  at  $100^\circ$ .

THALLIUM CHLORIDE  $\text{TlCl}$ .

## SOLUBILITY IN WATER.

(Average curve from results of Noyes — Z. physik. Chem. 9, 609, '92; Böttger — *Ibid.* 46, 602, '03; Kohlrausch — *Ibid.* 50, 350, '04; Hebbeling; Crookes; Lamy — The results of Berkeley — Trans. Roy. Soc. (Lond.) 203 A, 208, '04 are also given.)

$t^\circ$ .	Gms. $\text{TlCl}$ per Liter.		$t^\circ$ .	Gms. $\text{TlCl}$ per Liter.		$t^\circ$ .	Gms. $\text{TlCl}$ per Liter.	
0	2.1 (av.)	1.7 (B.)	25	3.86	4.0	60	8.0	10.2
10	2.5	2.4	30	4.2	4.6	80	12.0	16.0
20	3.3	3.4	40	5.2	6.0	100	18.0	24.1 (99.3°)
			50	6.3	8.0			

# THALLIUM CHLORIDE

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# THALLIUM CHLORIDE TlCl.

## SOLUBILITY IN WATER AND IN AQ. SALT SOLUTIONS AT 25°.

(Noyes; Noyes and Abbott; Geffcken — Z. physik. Chem. 49, 296, '04.)

Aq. Salt Solution.	G. Mols. per Liter.		Grams per Liter.	
	Salt.	TlCl.	Salt.	TlCl.
Ammonium Nitrate $\text{NH}_4\text{NO}_3$	0.0	0.01612	0.0	3.861 (G.)
"	0.5	0.02587	40.02	6.209
"	1.0	0.03121	80.05	7.473
"	2.0	0.03966	160.10	9.497
Barium Chloride $\text{BaCl}_2$	0.0283	0.00857	5.895	2.052 (N.)
"	0.1468	0.00323	30.59	0.773
Cadmium Sulphate $\text{CdSO}_4$	0.030	0.0206	6.255	4.933 (N.)
"	0.0787	0.0254	16.41	6.081
"	0.1574	0.0309	32.82	7.399
Hydrochloric Acid $\text{HCl}$	0.0283	0.00836	1.032	2.002 (N.)
"	0.0560	0.00565	2.043	1.353
"	0.1468	0.00316	5.357	0.757
Lithium Nitrate $\text{LiNO}_3$	0.5	0.02542	34.53	6.085 (G.)
"	1.0	0.03035	69.07	7.266
"	2.0	0.03785	138.14	9.063
"	3.0	0.04438	207.21	10.630
Potassium Chlorate $\text{KClO}_3$	0.5	0.0237	61.28	5.674 (G.)
Potassium Nitrate $\text{KNO}_3$	0.015	0.0170	1.517	4.070 (N.)
"	0.030	0.0179	3.033	4.286
"	0.0787	0.0192	7.775	4.597
"	0.1574	0.0212	15.920	5.076
"	0.5	0.0257	50.55	6.153 (G.)
"	1.0	0.0308	101.11	7.375
"	2.0	0.0390	202.22	9.340
Sodium Acetate $\text{CH}_3\text{COONa}$	0.015	0.0168	1.231	4.023 (N.)
"	0.030	0.0172	2.462	4.118
"	0.0787	0.0185	6.46	4.430
"	0.1574	0.0196	12.92	4.693
Sodium Nitrate $\text{NaNO}_3$	0.5	0.02564	42.50	6.139 (G.)
"	1.0	0.03054	85.01	7.313
"	2.0	0.03851	170.02	9.221
"	3.0	0.04544	255.03	10.88
"	4.0	0.05128	340.12	12.28
Sodium Chlorate $\text{NaClO}_3$	0.5	0.02320	53.25	5.555 (G.)
"	1.0	0.02687	106.5	6.433
"	2.0	0.03060	213.0	7.326
"	3.0	0.03303	319.5	7.909
"	4.0	0.03850	426.0	9.215
Thallium Bromate $\text{TlBrO}_3$ (at 39.75°)	0.01567	0.01959	5.201	4.690 (N.andA.)
Thallium Nitrate $\text{TlNO}_3$	0.0283	0.0083	7.518	1.987 (N.)
"	0.0560	0.00571	14.89	1.368
"	0.1468	0.00332	39.05	0.795
Thallium Sulphate $\text{Tl}_2\text{SO}_4$	0.0283	0.00886	14.27	2.121 (N.)
"	0.0560	0.00624	28.23	1.494
Thallium Sulphocyanide $\text{TlSCN}$	Sat.	0.0119	Sat.	2.849 (N.)
" (at 39.75°)	0.02149	0.01807	5.504	4.326 (N.andA.)

SOLUBILITY OF THALLIUM CHLORIDE IN AQUEOUS SOLUTIONS OF  
SALTS AT 25°.

(Noyes — Z. physik. Chem. 9, 609, '92.)

Aq. Salt Solution.	Gram. Equiv. per Liter.		Grams. per Liter.		Grams per Liter.	
	Salt.	TlCl.	Salt.	TlCl.	Salt.	TlCl.
NH <sub>4</sub> Cl	0.0	NH <sub>4</sub> Cl or HCl 0.01612	0.00	NH <sub>4</sub> Cl 3.861	0.00	HCl 3.861
and also	0.025	" 0.00873	1.338	" 2.101	0.886	" 2.0
HCl	0.05	" 0.00589	2.676	" 1.421	1.772	" 1.402
	0.10	" 0.00384	..	..	3.545	" 0.920
	0.20	" 0.00262	10.704	" 0.649	7.090	" 0.608
CuCl <sub>2</sub>	0.025	CuCl <sub>2</sub> or CaCl <sub>2</sub> 0.00902	3.36	CuCl <sub>2</sub> 2.161	3.77	CaCl <sub>2</sub> 2.161
and also	0.05	" 0.00619	6.72	" 1.483	7.55	" 1.483
CaCl <sub>2</sub>	0.10	" 0.00419	13.45	" 1.003	15.11	" 1.003
	0.20	" 0.00287	26.90	" 0.688	30.22	" 0.687
MgCl <sub>2</sub>	0.025	MgCl <sub>2</sub> or MnCl <sub>2</sub> 0.00901	2.381	MgCl <sub>2</sub> 2.158	3.147	MnCl <sub>2</sub> 2.158
and also	0.05	" 0.00618	4.763	" 1.480	6.295	" 1.480
MnCl <sub>2</sub>	0.10	" 0.00412	9.526	" 0.987	12.59	" 0.987
	0.20	" 0.00278	19.052	" 0.666	25.18	" 0.666
KCl	0.025	KCl or NaCl 0.00871	1.86	KCl 2.086	1.46	NaCl 2.086
and also	0.05	" 0.00592	3.73	" 1.418	2.925	" 1.418
NaCl	0.10	" 0.00397	7.46	" 0.951	5.85	" 0.951
	0.20	" 0.00268	14.92	" 0.642	11.70	" 0.642
TlClO <sub>3</sub>	0.025	TlClO <sub>3</sub> or TlNO <sub>3</sub> 0.00889	5.276	TlClO <sub>3</sub> 2.129	4.74	TlNO <sub>3</sub> 2.129
and also	0.05	" 0.00626	..	..	9.48	" 1.500
TlNO <sub>3</sub>	0.10	" 0.00423	..	..	18.96	" 1.014
ZnCl <sub>2</sub>	0.025	ZnCl <sub>2</sub> 0.00899	3.41	ZnCl <sub>2</sub> 2.153		
	0.05	" 0.00627	6.81	" 1.502		
	0.10	" 0.00412	13.63	" 0.987		
	0.20	" 0.00281	27.26	" 0.673		
CdCl <sub>2</sub>	0.025	CdCl <sub>2</sub> 0.0104	4.53	CdCl <sub>2</sub> 2.491		
	0.05	" 0.0078	9.16	" 1.868		
	0.10	" 0.00578	18.33	" 1.385		
	0.20	" 0.00427	36.66	" 1.029		

One liter of water dissolves 2.7 gms. *thallo thallic chloride* 3TlCl.TlCl<sub>3</sub> at 15°-17°, and 35.0 grams at 100°.

(Crookes; Lamy; Hebbeling.)

**THALLOUS CHROMATE Tl<sub>2</sub>CrO<sub>4</sub>.**

100 gms. H<sub>2</sub>O dissolve 0.03 gm. Tl<sub>2</sub>CrO<sub>4</sub> at 60°, and 0.2 gm. at 100°.

(Browning and Hutchins — Z. anorg. Chem. 22, 380, '00.)

One liter of aq. 31 per cent KOH solution dissolves 18 grams Tl<sub>2</sub>CrO<sub>4</sub>.

(Lepierre and Lachand — Compt. rend. 113, 196, '91.)

One liter of H<sub>2</sub>O dissolves 0.35 gram Thallous Tri Chromate Tl<sub>2</sub>Cr<sub>2</sub>O<sub>10</sub> at 15°, and 2.27 grams at 100°.

(Crookes.)

**THALLOUS CYANIDE**

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**THALLOUS CYANIDE**  $\text{TlCN}$  and Double Cyanides.**SOLUBILITY IN WATER.**

(Frommüller — Ber. 11, 92, '78.)

Cyanide.	Formula.	Gms. Salt per 100 Gms. $\text{H}_2\text{O}$ .
Tl Cyanide	$\text{TlCN}$	at $28.5^\circ$ , 16.8
Tl Cobalti Cyanide	$\text{Tl}_2\text{Co}(\text{CN})_6$	at $0^\circ$ , 3.6; at $9.5^\circ$ , 5.86; at $19.5^\circ$ , 10.04
Tl Zinc Cyanide	$2\text{TlCN} \cdot \text{Zn}(\text{CN})_2$	at $0^\circ$ , 8.7; at $14^\circ$ , 15.2; at $31^\circ$ , 29.6
Tl Ferro Cyanide	$\text{Tl}_4\text{Fe}(\text{CN})_6 \cdot 2\text{H}_2\text{O}$	at $18^\circ$ , 0.37 at $101^\circ$ , 3.93.

(Lamy.)

**THALLOUS FLUORIDE**  $\text{TlF}$ .100 gms.  $\text{H}_2\text{O}$  dissolve 80 gms.  $\text{TlF}$  at  $15^\circ$ .

(Buchner — Sitzb. K. Akad. Wiss. (Wien) 52, 2, 644, '65.)

**THALLIUM IODATE**  $\text{TlIO}_3$ .One liter aq. solution contains 0.578 gram  $\text{TlIO}_3$  at  $20^\circ$ .

(Böttger — Z. physik. Chem. 46, 602, '03.)

**THALLIUM IODIDE**  $\text{TlI}$ .**SOLUBILITY IN WATER.**

(Average results from Böttger; Kohlrausch; Werther; Crookes; Lamy; Hebbeling.)

t °.	0°.	20°.	40°.	60°.	80°.	100°.
Gms. $\text{TlI}$ per liter	0.02	0.06	0.15	0.35	0.70	1.20

One liter of  $2\frac{1}{2}$  per cent aq. ammonia dissolves 0.761 gm.  $\text{TlCl}$ .One liter of 6 $\frac{1}{2}$  per cent aq. ammonia dissolves 0.758 gm.  $\text{TlCl}$ .One liter of 90 per cent alcohol dissolves 0.0038 gm.  $\text{TlCl}$ .One liter of 50 per cent alcohol dissolves 0.027 gm.  $\text{TlCl}$ .

(Long — J. Anal. Ch. 2, 243, '88.)

**THALLIUM NITRATE**  $\text{TlNO}_3$ .**SOLUBILITY IN WATER.**

(Berkeley — Trans. Roy. Soc. (Lond.) 203 A, 213, '04; see also Etard — Ann. chim. phys. [7] 2, 527, '94; Crookes; Lamy.)

t °.	Gms. $\text{TlNO}_3$ per 100 Gms.		t °.	Gms. $\text{TlNO}_3$ per 100 Gms.	
	Solution.	Water.		Solution.	Water.
0	3.76	3.91	60	31.55	46.2
10	5.86	6.22	70	41.01	69.5
20	8.72	9.55	80	52.6	111.0
30	12.51	14.3	90	66.66	200.0
40	17.33	20.9	100	80.54	414.0
50	23.33	30.4	105	85.59	594.0

Solid phase.  $\text{TlNO}_3$  rhombic.100 gms.  $\text{H}_2\text{O}$  dissolve 43.5 gms.  $\text{TlNO}_3$  + 104.2 gms.  $\text{KNO}_3$  at  $58^\circ$ .

(Rabe — Z. anorg. Chem. 31, 156, '02.)

**THALLIUM OXALATE**  $\text{Tl}_2\text{C}_2\text{O}_4$ .One liter of saturated aqueous solution contains 15.77 grams  $\text{Tl}_2\text{C}_2\text{O}_4$  at  $20^\circ$ , and 18.69 gms. at  $25^\circ$ .

(Böttger — Z. physik. Chem. 46, 602, '03; Abegg and Spencer — Z. anorg. Chem. 46, 406, '05.)

## SOLUBILITY OF THALLIUM OXALATE AT 25° IN AQ. SOLUTIONS OF:

Thallium Nitrate. (Abegg and Spencer.)				Potassium Oxalate. (A. and S.)			
Mol. Concentration.		Grams per Liter.		Mol. Concentration.		Grams per Liter.	
TlNO <sub>3</sub> .	Tl <sub>2</sub> C <sub>2</sub> O <sub>4</sub> .	TlNO <sub>3</sub> .	Tl <sub>2</sub> C <sub>2</sub> O <sub>4</sub> .	K <sub>2</sub> C <sub>2</sub> O <sub>4</sub> .	Tl <sub>2</sub> C <sub>2</sub> O <sub>4</sub> .	K <sub>2</sub> C <sub>2</sub> O <sub>4</sub> .	Tl <sub>2</sub> C <sub>2</sub> O <sub>4</sub> .
0.0	0.03768	0.00	18.69	0.0498	0.0351	8.281	17.42
0.04114	0.0264	10.95	13.10	0.0996	0.03565	16.57	17.69
0.0799	0.0195	21.26	9.68	0.2467	0.0390	41.02	19.36
0.1597	0.01235	42.51	6.128	0.4886	0.04506	81.25	22.37
				0.9785	0.05536	162.6	27.48

THALLOUS PHOSPHATE (ortho) Tl<sub>2</sub>PO<sub>4</sub>.

One liter of sat. aqueous solution contains 4.97 gms. Tl<sub>2</sub>PO<sub>4</sub> at 15° and 6.71 gms. at 100°.

(Crookes.)

THALLIUM PICRATE TiOC<sub>6</sub>H<sub>3</sub>(NO<sub>2</sub>)<sub>3</sub>.SOLUBILITY IN WATER.  
(Rabe — Z. phys. Chem. 38, 179, '01.)

t°.	Gms. TiOC <sub>6</sub> H <sub>3</sub> (NO <sub>2</sub> ) <sub>3</sub> per 100 Gms. H <sub>2</sub> O.	Solid Phase.	t°.	Gms. TiOC <sub>6</sub> H <sub>3</sub> (NO <sub>2</sub> ) <sub>3</sub> per 100 Gms. HO <sub>2</sub> .	Solid Phase.
0	0.135	Monoclinic Red	45	1.04	Triclinic Yellow
18	0.36	"	47	1.10	"
30	0.575	"	50	1.205	"
40	0.825	"	60	1.73	"
45	1.01	"	70	2.43	"
47	1.14	"			"

100 gms. H<sub>2</sub>O dissolve 0.132 gm. C<sub>6</sub>H<sub>3</sub>(NO<sub>2</sub>)<sub>3</sub>OTl + 0.36 gram C<sub>6</sub>H<sub>3</sub>(NO<sub>2</sub>)<sub>3</sub>OK at 0°.

100 gms. H<sub>2</sub>O dissolve 0.352 gm. C<sub>6</sub>H<sub>3</sub>(NO<sub>2</sub>)<sub>3</sub>OTl + 0.44 gram C<sub>6</sub>H<sub>3</sub>(NO<sub>2</sub>)<sub>3</sub>OK at 15°.

100 gms. H<sub>2</sub>O dissolve 0.38 gm. C<sub>6</sub>H<sub>3</sub>(NO<sub>2</sub>)<sub>3</sub>OTl + 0.23 gram C<sub>6</sub>H<sub>3</sub>(NO<sub>2</sub>)<sub>3</sub>OK at 20°.

(Rabe.)

## SOLUBILITY OF THALLIUM PICRATE IN METHYL ALCOHOL.

(Rabe.)

t°.	Gms. TiOC <sub>6</sub> H <sub>3</sub> (NO <sub>2</sub> ) <sub>3</sub> per 100 Gms. CH <sub>3</sub> OH.	Solid Phase.	t°.	Gms. TiOC <sub>6</sub> H <sub>3</sub> (NO <sub>2</sub> ) <sub>3</sub> per 100 Gms. CH <sub>3</sub> OH.	Solid Phase.
0	0.39	Red Form (monoclinic).	45	1.195	Yellow Form (triclinic).
18	0.59	"	48	1.265	"
25	0.70	"	50	1.325	"
30	0.795	"	53	1.41	"
35	0.90	"	57	1.54	"
40	1.02	"	60	1.65	"
45	1.17	"	65	1.84	"
47	1.265	"			

**THALLIUM SULPHATE**

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**THALLIUM SULPHATE  $Tl_2SO_4$ .****SOLUBILITY IN WATER.**

(Berkeley — Trans. Roy. Soc. (Lond.) 203 A 211, '04; see also Crookes; Lamy.)

t°.	Gms. $Tl_2SO_4$ per 100 Gms.		t°.	Gms. $Tl_2SO_4$ per 100 Gms.	
	Solution.	Water.		Solution.	Water.
0	2.63	2.70	60	9.89	10.92
10	3.57	3.70	70	11.31	12.74
20	4.64	4.87	80	12.77	14.61
30	5.80	6.16	90	14.19	16.53
50	8.44	9.21	99.7	15.57	18.45

100 gms.  $H_2O$  dissolve 4.74 gms.  $Tl_2SO_4$  + 10.3 gms.  $K_2SO_4$  at 15°.100 gms.  $H_2O$  dissolve 11.5 gms.  $Tl_2SO_4$  + 16.4 gms.  $K_2SO_4$  at 62°.100 gms.  $H_2O$  dissolve 18.52 gms.  $Tl_2SO_4$  + 26.2 gms.  $K_2SO_4$  at 100°.

(Rabe — Z. anorg. Ch. 31, 156, '02.)

**THALLIUM SULPHIDE  $Tl_2S$ .**One liter of sat. aqueous solution contains 0.215 gm.  $Tl_2S$  at 20°.

(Böttger — Z. phys. Chem. 46, 602, '03.)

**THALLIUM DOUBLE SULPHATES****SOLUBILITY IN WATER AT 25°.**

(Locke — Am. Ch. J. 27, 459, '01.)

Double Sulphate.	Formula.	Salt per 100 cc. $H_2O$ .	
		Gms. Anhydrous.	Gram Mols.
Tl Copper Sulphate	$Tl_2Cu(SO_4)_2 \cdot 6H_2O$	8.1	0.0122
Tl Nickel Sulphate	$Tl_2Ni(SO_4)_2 \cdot 6H_2O$	4.61	0.007
Tl Zinc Sulphate	$Tl_2Zn(SO_4)_2 \cdot 6H_2O$	8.6	0.0129

**THALLIUM SULPHOCYANIDE TISCN.****SOLUBILITY IN WATER AND IN AQUEOUS SALT SOLUTIONS.**

(Böttger; Noyes; Noyes and Abbott.)

One liter sat. aq. solution contains 3.154 gms. TISCN at 20°, 3.905 gms. at 25°, and 7.269 gms. at 39.75°.

Aq. Salt Solution.	t°.	Gm. Mols. per Liter.		Grams per Liter.	
		Salt.	TISCN.	Salt.	TISCN.
Thallium Chloride $TlCl$	25	sat.	0.0107	sat.	2.805 (N.)
Thallium Bromate $TlBrO_3$	39.75	0.01496	0.0221	4.966	5.793 (N. and A.)
Thallium Nitrate $TlNO_3$	25	0.0227	0.00852	6.04	2.233 (N.)
"	25	0.0822	0.00406	21.88	1.064
Potassium Sulphocyanide, $KSCN$	25	0.0227	0.0083	2.208	2.176 (N.)

**THALLIUM CARBONATE  $Tl_2CO_3$ .****SOLUBILITY IN WATER.**

(Crookes; Lamy.)

t°	15.5°	18°	62°	100°	100.8°
Gms. $Tl_2CO_3$ per 100 gms. $H_2O$	4.2 (C.)	5.23	12.85	27.2 (C.)	22.4

**THALLIUM (Per) CHLORATE  $TlClO_4$ .**100 grams  $H_2O$  dissolve 10 gms.  $TlClO_4$  at 15°, and 166.6 gms. at 100°.

(Roscoe — J. Chem. Soc. 19, 504, '66.)

**THALLIUM SULPHITE**  $\text{Tl}_2\text{SO}_3$ .100 gms.  $\text{H}_2\text{O}$  dissolve 3.34 gms.  $\text{Tl}_2\text{SO}_3$  at  $15.5^\circ$ .

(Seubert and Elken — Z. anorg. Chem. 2 434, '92.)

**THALLIUM VANADATES.**

## SOLUBILITY IN WATER.

(Carnelly — J. Chem. Soc. [2] 11, 323, '73; Liebig's Ann. 116, 155, '60.)

Vanadate.	Formula.	Gms. Vanadate per 100 Gms. $\text{H}_2\text{O}$ .	
		At $15^\circ$ .	At $100^\circ$ .
Tl. meta Vanadate	$\text{TlVO}_3$	0.087 ( $11^\circ$ )	0.21
" ortho Vanadate	$\text{Tl}_2\text{VO}_3$	1.0	1.74
" pyro Vanadate	$\text{Tl}_4\text{V}_2\text{O}_7$	0.20 ( $14^\circ$ )	0.26
" Vanadate	$\text{Tl}_{12}\text{V}_8\text{O}_{28}$	0.107	0.29

**THEOBROMINE**  $\text{C}_7\text{H}_5(\text{CH}_3)_2\text{N}_4\text{O}_2$ .

100 gms. carbon tetra chloride dissolve 0.0212 gm. at b. pt.

100 gms. ether dissolve 0.032 gm. at b. pt.

(Göckel — Chem. Centralb. ii, 401, '97.)

80 cc.  $\text{H}_2\text{O}$  containing 14.8 gms. tri sodium phosphate dissolve 3.5 gms. theobromine at  $15^\circ$ .

(Brisse-Moret — J. pharm. chim. [6] 7, 176, '98.)

**THORIUM SELENATE**  $\text{Th}(\text{SeO}_4)_4 \cdot 9\text{H}_2\text{O}$ .100 gms.  $\text{H}_2\text{O}$  dissolve 0.498 gm.  $\text{Th}(\text{SeO}_4)_4$  at  $0^\circ$  and 1.972 gms. at  $100^\circ$ .

(Cleve — Bull. Soc. chim. [2] 43, 166, '85.)

**THORIUM SULPHATE**  $\text{Th}(\text{SO}_4)_2$ .

## SOLUBILITY IN WATER.

(Roozeboom — Z. phys. Chem. 5, 201, '90; Demarcay — Compt. rend. 96, 1860, '83.)

$t^\circ$ .	Gms. $\text{Th}(\text{SO}_4)_2$ per 100 Gms. $\text{H}_2\text{O}$ .		Solid Phase.	$t^\circ$ .	Gms. $\text{Th}(\text{SO}_4)_2$ per 100 Gms. $\text{H}_2\text{O}$ .		Solid Phase.
0	0.74 (R)	0.88 (D)	$\text{Th}(\text{SO}_4)_2 \cdot 9\text{H}_2\text{O}$	0	1.50 (R)		$\text{Th}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$
10	0.98	1.02	"	15	1.63		"
20	1.38	1.25	"	30	2.45		"
30	1.995	1.85	"	45	3.85		"
40	2.998	2.83	"	60	6.64		"
50	5.22 ( $51^\circ$ )	4.86	"	17	9.41 (D)		$\text{Th}(\text{SO}_4)_2 \cdot 4\text{H}_2\text{O}$
55	6.76	6.5±	"	40	4.04 (R)	4.5 ( $35^\circ$ D)	
0	1.0		$\text{Th}(\text{SO}_4)_2 \cdot 8\text{H}_2\text{O}$	50	2.54	1.94 ( $55^\circ$ )	"
15	1.38		"	60	1.63	...	"
25	1.85		"	70	1.09	1.32 ( $75^\circ$ )	"
44	3.71		"	95	...	0.71	"



## TIN CHLORIDE

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### TIN CHLORIDE (Stannous) $\text{SnCl}_2$ .

100 gms.  $\text{H}_2\text{O}$  dissolve 83.9 gms.  $\text{SnCl}_2$  at  $0^\circ$  and 269.8 gms. at  $15^\circ$ ,  
Sp. Gr. of Solutions 1.532 and 1.827 respectively.

(Engel — Ann. chim. phys. [6] 17, 347, '89; Michel and Krafft — *Ibid.* [3] 41, 478, '51.)

#### SOLUBILITY OF STANNOUS CHLORIDE IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID AT $0^\circ$ .

(Engel.)

Milligram Mols. per 10 cc. Solution.		Sp. Gr. of Solution.	Grams per 100 cc. Solution.	
HCl.	$\frac{1}{2}\text{SnCl}_2$ .		HCl.	$\text{SnCl}_2$ .
0	74.0	1.532	0.0	70.26
6.6	66.7	1.489	2.405	63.33
13.54	63.75	1.472	4.935	60.52
24.8	68.4	1.524	9.04	64.95
34.9	81.2	1.625	12.72	77.11
40.0	94.2	1.724	14.58	89.45
44.0	117.6	1.883	16.04	111.7
49.4	147.6	2.114	18.01	138.6
66.0	156.4	2.190	24.05	148.5
78.0	157.0	2.199	28.43	149.0

100 gms. acetone dissolve 55.6 gms.  $\text{SnCl}_2$  at  $18^\circ$ .

(Naumann — Ber. 37, 4332, '04.)

100 gms. ether dissolve 11.4 gms.  $\text{SnCl}_2 \cdot 2\text{H}_2\text{O}$  at  $0^\circ$ – $35.5^\circ$ .

100 gms. ethyl acetate dissolve 31.2 gms.  $\text{SnCl}_2 \cdot 2\text{H}_2\text{O}$  at  $-2^\circ$ , 35.53  
gms. at  $+22^\circ$  and 73.44 gms. at  $82^\circ$ .

(von Laszynyaki — Ber. 27, 2285, '04.)

### TIN HYDROXIDE $\text{Sn(OH)}_2$ .

#### SOLUBILITY IN AQUEOUS SODIUM HYDROXIDE SOLUTIONS. MOIST TIN HYDROXIDE USED, ORDINARY TEMPERATURE.

(Rubenbauer — Z. anorg. Chem. 30, 335, '02.)

Gms. per 20 cc. Solution.		Mol. Dilution of the $\text{NaOH}$ .	Gms. per 20 cc. Solution.		Mol. Dilution of the $\text{NaOH}$ .
Na.	Sn.		Na.	Sn.	
0.2480	0.1904	1.86	0.8326	0.5560	0.55
0.3680	0.2614	1.25	0.9661	0.7849	0.48
0.6394	0.4304	0.72	2.1234	1.8934	0.23

### TIN IODIDE (Stannous) $\text{SnI}_2$ .

#### SOLUBILITY IN WATER AND IN AQUEOUS HYDRIODIC ACID.

(Young — J. Am. Chem. Soc. 19, 851, '97.)

$t^\circ$ .	Gms. $\text{SnI}_2$ per 100 Gms. Aqueous HI Solutions of:							
	$0\% = \text{H}_2\text{O}$ .	5.83%.	9.60%.	15.2%.	20.44%.	24.8%.	30.4%.	36.82%.
20	0.98	0.20	0.23	0.60	1.81	4.20	10.86	25.31
30	1.16	0.23	0.23	0.64	1.81	4.06	10.28	23.46
40	1.40	0.33	0.28	0.71	1.90	4.12	10.06	23.15
50	1.69	0.46	0.38	0.82	2.12	4.34	10.35	23.76
60	2.07	0.66	0.55	1.11	2.51	4.78	11.03	24.64
70	2.48	0.91	0.80	1.37	2.92	5.43	11.97	25.72
80	2.95	1.23	1.13	1.83	3.70	6.38	13.30	27.23
90	3.46	1.65	1.52	2.40	4.58	7.82	15.52	29.84
100	4.03	2.23	2.04	3.63	5.82	9.60	...	34.05

**TIN IODIDE** (Stannic)  $\text{SnI}_4$ .**SOLUBILITY IN CARBON BISULPHIDE.**

(Sneider — Pogg. Ann. 127, 624, '66; Arctowski — Z. anorg. Chem. 11, 274, '95.)

t°.	-114°.5	-94°	-89°	-84°	-58°	ord. temp.
Gms. $\text{SnI}_4$ per 100 gms. Solution	9.41	10.65	9.68	10.22	16.27	59.2(S.)

100 gms. methylene iodide,  $\text{CH}_2\text{I}_2$ , dissolve 22.9 gms.  $\text{SnI}_4$  at 10°.  
 Sp. Gr. of Solution 3.481.

(Retgers — Z. anorg. Chem. 3, 343, '93.)

**TIN SULPHATE** (Stannous)  $\text{SnSO}_4$ .

100 gms.  $\text{H}_2\text{O}$  dissolve 18.8 gms.  $\text{SnSO}_4$  at 19° and 18.1 gms. at 100°.  
 (Marignac.)

**TOLUENE**  $\text{C}_6\text{H}_5\text{CH}_3$ .**SOLUBILITY IN SULPHUR.**

Figures read from curve, synthetic method used, see Note, page 9.

(Alexejew — Ann. Physik. Ch. 28, 305, '86.)

t°.	Gms. $\text{C}_6\text{H}_5\text{CH}_3$ per 100 Gms.		t°.	Gms. $\text{C}_6\text{H}_5\text{CH}_3$ per 100 Gms	
	S Layer.	Toluene Layer.		S Layer.	Toluene Layer.
100	3	73	150	12.5	59
110	4	71	160	16	53
120	5	68	170	22	47
130	7	66	175	25	43
140	9.5	63	178 crit. temp.	34	

**TOLUIC ACIDS** (Monomethyl Benzoic Acids)  $\text{CH}_3\text{C}_6\text{H}_4\text{COOH}$ .**SOLUBILITY IN WATER AT 25°.**

(Paul — Z. physik. Chem. 14, 111, '94.)

Acid.	$\text{CH}_3\text{C}_6\text{H}_4\text{COOH}$ per Liter Solution.	
	Grams.	Millimols.
Meta Toluic Acid	0.0801	7.207
Ortho Toluic Acid	1.1816	8.683
Para Toluic Acid	0.3454	2.540

**TOLUIDINE**  $\text{C}_6\text{H}_4\text{CH}_3\text{NH}_2$ .**SOLUBILITY IN WATER.**

(Vaubel — J. pr. Chem. [2] 52, 72, '95; Lowenherz — Z. physik. Chem. 25, 410, '98.)

t°.	Gms. $\text{C}_6\text{H}_4\text{CH}_3\text{NH}_2$ per 1000 Gms. $\text{H}_2\text{O}$ .		t°.	Gms. $\text{C}_6\text{H}_4\text{CH}_3\text{NH}_2$ per 1000 Gms. $\text{H}_2\text{O}$ .	
		Solid Phase.			Solid Phase.
20	16.26	Liquid ortho T.	20.8	7.39	Para T.
20	0.15	Ortho T.	26.7	9.50	"
20	6.54	Para T.	31.7	11.42	"

## TOLUIDINE

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## SOLUBILITY OF PARA TOLUIDINE IN ETHYL ALCOHOL.

(Interpolated from original results of Speyers — Am. J. Sci. [4] 14, 295, '02.)

t°.	Wt. of 1 cc. Solution.	Mols. per 100 Mols. C <sub>2</sub> H <sub>5</sub> OH.	Gms. per 100 Gms. C <sub>2</sub> H <sub>5</sub> OH.	t°.	Wt. of 1 cc. Solution.	Mols. per 100 Mols. C <sub>2</sub> H <sub>5</sub> OH.	Gms. per 100 Gms. C <sub>2</sub> H <sub>5</sub> OH.
0	0.8885	20.72	48.1	20	0.9265	47.0	110.0
5	0.8982	26.0	60.0	25	0.9360	56.0	132.0
10	0.9080	32.0	74.0	30	0.9460	66.0	156.0
15	0.9180	38.6	90.0				

Distribution of para Toluidine between water and carbon tetra chloride.

(Vaubel — J. pr. Chem. [2] 67, 478, '03.)

Gms. $\phi$ Toluidin Used.	Volumes of Solvents.	Gms. C <sub>6</sub> H <sub>4</sub> (CH <sub>3</sub> )NH <sub>2</sub> $\phi$ in:	
		H <sub>2</sub> O Layer.	CCl <sub>4</sub> Layer.
1.0	200 cc. H <sub>2</sub> O + 100 cc. CCl <sub>4</sub>	0.1406	0.8594
1.0	200 cc. H <sub>2</sub> O + 200 cc. CCl <sub>4</sub>	0.0666	0.9334

URANYL CHLORIDE UO<sub>2</sub>Cl<sub>2</sub>·3H<sub>2</sub>O.100 gms. H<sub>2</sub>O dissolve 320 gms. UO<sub>2</sub>Cl<sub>2</sub> at 18°.

(Mylius and Dietz — Ber. 34, 2774, '01.)

## URANYL DOUBLE CHLORIDES.

SOLUBILITY OF URANYL AMMONIUM CHLORIDE, U. TETRA METHYL AMMONIUM CHLORIDE, U. TETRA ETHYL AMMONIUM CHLORIDE, U. CAESIUM CHLORIDE, U. RUBIDIUM CHLORIDE, AND U. POTASSIUM CHLORIDE IN WATER.

(Rimbach — Ber. 37, 463, '04.)

Formula of Double Salt.	t°.	Gms. per 100 Gms. Sat. Solution.		Atomic Relation in Sol.	Solid Phase.
UO <sub>2</sub> Cl <sub>2</sub> ·2NH <sub>4</sub> Cl·2H <sub>2</sub> O	15	40.67	UO <sub>2</sub> + 3.51NH <sub>4</sub> + 19.15Cl	1UO <sub>2</sub> : 1.59NH <sub>4</sub> : 3.59Cl	1 Mol. double salt + 0.4 Mol. NH <sub>4</sub> Cl
UO <sub>2</sub> Cl <sub>2</sub> ·2N(CH <sub>3</sub> ) <sub>4</sub> Cl	20.8	19.85	" + 10.44Cl <sub>2</sub> = 41.24 *	1UO <sub>2</sub> : 4.02Cl	Double salt
	80.7	20.23	" + 10.52Cl <sub>2</sub> = 4.91 *	1UO <sub>2</sub> : 3.98Cl	"
UO <sub>2</sub> Cl <sub>2</sub> ·2N(C <sub>2</sub> H <sub>5</sub> ) <sub>4</sub> Cl	27.1	15.02	" + 7.81Cl <sub>2</sub> = 37.15 †	1UO <sub>2</sub> : 3.07Cl	"
	80.7	15.12	" + 7.78Cl <sub>2</sub> = 37.23 †	1UO <sub>2</sub> : 3.04Cl	"
UO <sub>2</sub> Cl <sub>2</sub> ·2CsCl	29.75	22.11	" + 22.5 Cs = 56.04 ‡	1UO <sub>2</sub> : 2.07Cs	"
UO <sub>2</sub> Cl <sub>2</sub> ·2RbCl·2H <sub>2</sub> O	24.8	27.18	" + 16.6 Rb + 13.8Cl ‡	1UO <sub>2</sub> : 1.96Rb: 3.90Cl	"
	80.3	30.66	" + 10.1 Rb + 15.8Cl ‡	1UO <sub>2</sub> : 1.98Rb: 3.95Cl	"
UO <sub>2</sub> Cl <sub>2</sub> ·2KCl·2H <sub>2</sub> O	0.8	38.57	" + 13.59Cl + 3.86K	1UO <sub>2</sub> : 2.09Cl: 0.69K	The double salt is decomposed by water at temperatures below 60°.
"	14.9	33.71	" + 13.51Cl + ... K	1UO <sub>2</sub> : 3.06Cl: 1.06K	
"	17.5	37.36	" + 14.50Cl + 5.27K	1UO <sub>2</sub> : 2.96Cl: 0.96K	
"	25.0	35.01	" + 15.26Cl + ... K	1UO <sub>2</sub> : 3.33Cl: 1.33K	
"	41.5	35.27	" + 15.92Cl + 7.39K	1UO <sub>2</sub> : 3.44Cl: 1.44K	
"	50	34.18	" + 16.56Cl + ... K	1UO <sub>2</sub> : 3.71Cl: 1.71K	
"	60	34.19	" + 17.25Cl + 9.14K	1UO <sub>2</sub> : 3.85Cl: 1.85K	
"	71.5	33.55	" + 17.44Cl + 9.28K	1UO <sub>2</sub> : 3.96Cl: 1.96K	
"	78.5	35.26	" + 18.24Cl + 9.95K	1UO <sub>2</sub> : 3.95Cl: 1.95K	Double salt

\* UO<sub>2</sub>Cl<sub>2</sub>·2N(CH<sub>3</sub>)<sub>4</sub>Cl.† UO<sub>2</sub>Cl<sub>2</sub>·N(C<sub>2</sub>H<sub>5</sub>)<sub>4</sub>Cl.‡ UO<sub>2</sub>Cl<sub>2</sub>·2CsCl.§ = 57.9 gms. UO<sub>2</sub>Cl<sub>2</sub>·2RbCl<sub>2</sub>.|| = 65.8 gms. UO<sub>2</sub>Cl<sub>2</sub>·2RbCl<sub>2</sub>.

**URANYL SODIUM CHROMATE****URANYL SODIUM CHROMATE**  $2(\text{UO}_2)_2\text{CrO}_4 \cdot \text{Na}_2\text{CrO}_4 \cdot 10\text{H}_2\text{O}$ .100 gms. sat. aqueous solution contains 52.52 gms.  $(2\text{UO}_2)_2\text{CrO}_4 \cdot \text{Na}_2\text{CrO}_4$  at  $20^\circ$ . (Rimbach.)**URANYL POTASSIUM BUTYRATE**  $\text{UO}_2(\text{C}_4\text{H}_7\text{O}_2)_2 \cdot \text{KC}_4\text{H}_7\text{O}_2$ .The double salt is decomposed by water at ordinary temperatures and the solution gets richer in uranyl butyrate. The solubility at  $29.4^\circ$  in water containing  $\text{KC}_4\text{H}_7\text{O}_2$  is 2.10 gms.  $\text{UO}_2(\text{C}_4\text{H}_7\text{O}_2)_2 + 0.38$  gms.  $\text{KC}_4\text{H}_7\text{O}_2$  per 100 gms. solution. The atomic relation being 1 : 0.64. (Rimbach.)**URANYL NITRATE**  $\text{UO}_2(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$ .**SOLUBILITY IN WATER, ETC.**

(Bucholz; de Coninck — Compt. rend. 130, 1304, '00.)

100 gms. cold water dissolve 200 gms.  $\text{UO}_2(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$ .100 gms. abs. alcohol dissolve 333 gms.  $\text{UO}_2(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$ .100 gms. 85% alcohol dissolve 3.3 gms.  $\text{UO}_2(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$  at  $12^\circ$  (de C.)100 gms. ether dissolve 25 gms.  $\text{UO}_2(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$ .100 gms. abs. acetone dissolve 1.5 gms.  $\text{UO}_2(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$  at  $12^\circ$  (de C.)

For densities of Uranium nitrate solutions in water and other solvents see de Coninck — Compt. rend. 131, 1219, '00.)

**URANYL DOUBLE NITRATES.****SOLUBILITY OF URANYL AMMONIUM NITRATE, U. CAESIUM NITRATE, U. POTASSIUM NITRATE, AND U. RUBIDIUM NITRATE IN WATER.**

(Rimbach.)

Formula of Salt.	g.	Gms. per 100 Gms. Sat. Solution.		Atomic Relation in Solution.
		$\text{UO}_2$	Total Salt.	
$\text{UO}_2(\text{NO}_3)_2 \cdot \text{NH}_4\text{NO}_3$	0.5	29.71 + 2.92	$\text{NH}_4 = \dots$	$1\text{UO}_2 : 1.47\text{NH}_4 : 3.47\text{NO}_3$
"	24.9	36.46 + 3.54	" = 68.95	" : 1.46 " : 3.46 "
"	59.0	44.37 + 2.90	" = ...	" : 0.98 " : 2.98 "
"	80.7	44.95 + 2.98	" = 78.95	" : 1.00 " : 3.00 "
$\text{UO}_2(\text{NO}_3)_2 \cdot \text{CsNO}_3$	16.0	31.39 + 6.59	$\text{Cs} = 55.4$	" : 0.44 $\text{Cs}$
$\text{UO}_2(\text{NO}_3)_2 \cdot \text{KNO}_3$	0.5	31.98 + 1.72	$\text{K} = \dots$	" : 2.37 $\text{NO}_3$ : 0.37 $\text{K}$
"	13.0	33.40 + 2.72	" = ...	" : 2.57 " : 0.57 "
"	25.0	37.07 + 4.01	" * = 64.82	" : 1.60 " : 0.76 "
"	45.0	42.18 + 5.16	" = ...	" : 2.84 " : 0.84 "
"	59.0	41.65 + 6.03	" = ...	" : 3.00 " : 1.00 "
"	80.6	43.71 + 6.38	" = ...	" : 3.01 " : 1.01 "
$\text{UO}_2(\text{NO}_3)_2 \cdot \text{RbNO}_3$	25.0	35.41 + 4.65	$\text{Rb} \dagger = 59.60$	" : 1.40 " : 0.45 $\text{Rb}$
"	80.0	34.66 + 11.01	" = 69.49	" : 3.00 " : 1.01 "

\* + 23.5  $\text{NO}_3$ .† + 19.74  $\text{NO}_3$ .**URANYL AMMONIUM PROPIONATE**  $2\text{UO}_2(\text{C}_3\text{H}_7\text{O}_2)_2 \cdot \text{NH}_4\text{C}_3\text{H}_7\text{O}_2 \cdot 2\text{H}_2\text{O}$  and Uranyl Potassium Propionate  $2\text{UO}_2(\text{C}_3\text{H}_7\text{O}_2)_2 \cdot \text{KC}_3\text{H}_7\text{O}_2$ .

(Rimbach.)

100 gms. aq. solution contain 16.48 gms.  $2\text{UO}_2(\text{C}_3\text{H}_7\text{O}_2)_2 \cdot \text{NH}_4\text{C}_3\text{H}_7\text{O}_2 \cdot 2\text{H}_2\text{O}$  at  $29.8^\circ$ .100 gms. aq. solution contain 2.362 gms.  $\text{UO}_2(\text{C}_3\text{H}_7\text{O}_2)_2 + 0.82$  gm.  $\text{KC}_3\text{H}_7\text{O}_2$  at  $29.4^\circ$ , atomic relation, 1 : 1.29.

## URANYL SULPHATE

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### URANYL SULPHATE $(\text{UO})_2\text{SO}_4 \cdot 3\text{H}_2\text{O}$ .

#### SOLUBILITY IN WATER, ETC.

(Bucholz; de Coninck — Bull. Acad. Roy. Belgique, 350, '01.)

100 gms.  $\text{H}_2\text{O}$  dissolve 16.6 gms.  $\text{UO}_2(\text{SO}_4) \cdot 3\text{H}_2\text{O}$  at  $13.2^\circ$ , 17.4 gms. at  $15.5^\circ$ , and 22.2 gms. at b. pt.

100 gms. abs. alcohol dissolve 4.0 gms.  $\text{UO}_2(\text{SO}_4) \cdot 3\text{H}_2\text{O}$  at  $18.2^\circ$  and 5.0 gms. at b. pt.

100 gms. 85% alcohol dissolve 2.6 gms.  $\text{UO}_2(\text{SO}_4) \cdot 3\text{H}_2\text{O}$  at  $16^\circ$ .

100 gms. 16.2% alcohol dissolve 12.3 gms.  $\text{UO}_2(\text{SO}_4) \cdot 3\text{H}_2\text{O}$  at  $10^\circ$ .

### URANYL POTASSIUM SULPHATE $\text{UO}_2\text{SO}_4 \cdot \text{K}_2\text{SO}_4 \cdot 2\text{H}_2\text{O}$

100 gms. sat. aq. solution contain 10.41 gms.  $\text{UO}_2\text{SO}_4 \cdot \text{K}_2\text{SO}_4$  at  $25^\circ$  and 23.13 gms. at  $70.5^\circ$ . (Rimbach.)

#### SOLUBILITY OF $\text{UO}_2\text{SO}_4 \cdot 2\text{K}_2\text{SO}_4 \cdot 2\text{H}_2\text{O} + \text{UO}_2\text{SO}_4 \cdot \text{K}_2\text{SO}_4 \cdot 2\text{H}_2\text{O}$ IN WATER.

t°.	Gms. per 100 Gms. Solution.			Atomic Relation in Sol.			Mol. % in Solid Phase.	
	$\text{UO}_2$ .	K.	$\text{SO}_4$ .	$\text{UO}_2$ .	K.	$\text{SO}_4$ .	Mono Salt.	Di Salt.
14	0.85	4.19	5.71	1	35.75	18.88	29	71
50	6.70	8.15	12.37	1	5.20	8.40	76	24
80	14.29	8.54	15.53	1	4.13	3.06	12	88

### UREA $\text{CO}(\text{NH}_2)_2$ .

#### SOLUBILITY IN WATER AND IN ALCOHOLS.

(Campetti — Abstract, Z. phys. Chem. 41, 109, '02; Speyers — Am. J. Sci. [4] 14, 259, '02.)

NOTE. — Speyer's original results are in terms of Mols.  $\text{CO}(\text{NH}_2)_2$  per 100 Mols.  $\text{H}_2\text{O}$  at irregular temperatures.

t°.	In Water.			In Methyl Alcohol.		In Ethyl Alcohol.	
	Wt. of 1 cc. Solution.	Gms. $\text{CO}(\text{NH}_2)_2$ per 100 Gms. $\text{H}_2\text{O}$ .		Wt. of 1 cc. Solution.	Gms. $\text{CO}(\text{NH}_2)_2$ per 100 Gms. $\text{CH}_3\text{OH}$ .	Wt. of 1 cc. Solution.	Gms. $\text{CO}(\text{NH}_2)_2$ per 100 Gms. $\text{C}_2\text{H}_5\text{OH}$ .
0	1.121	55.9	...	0.861	13.8	0.8213	2.5
10	1.134	66.0	85.0 (C)	0.863	16.0	0.814	3.5
20	1.146	79.0	108.2 (C)	0.869	20.0	0.809	5.0
30	1.156	93.0	...	0.876	24.0	0.806	6.5
40	1.165	106.0	...	0.890	30.0	0.804	8.5
50	1.173	120.0	...	0.908	37.0	0.803	10.5
60	1.180	132.0	...	0.928	47.0	...	13.0
70	1.187	145.0	...	...	...	...	17.5

100 gms. abs. methyl alcohol dissolve 21.8 gms.  $\text{CO}(\text{NH}_2)_2$  at  $19.5^\circ$ .

100 gms. abs. ethyl alcohol dissolve 5.06 gms.  $\text{CO}(\text{NH}_2)_2$  at  $19.5^\circ$ .

(de Bruyn — Z. phys. Chem. 10, 784, '02.)

100 gms. glycerine dissolve 50 gms. urea at  $15.5^\circ$ .

### Phenyl Thio UREA (Phenyl thio carbamide) $\text{CS.NH}_2.\text{NHC}_6\text{H}_5$ .

#### SOLUBILITY IN WATER.

(Rothmund — Z. phys. Ch. 33, 406, '00; Biltz — *Ibid.* 43, 42, '03; Holeman and Antusch — Rec. trav. chim. 13, 290, '04; Bogdan — Ann. Scien. L'Univ. Jassy 2, 43, '02, '03.)

One liter aq. solution contains 2.12 gms.  $\text{CS}(\text{NH}_2).\text{NHC}_6\text{H}_5$  at  $20^\circ$  (B.), (R.) and 2.4 gms. at  $25^\circ$ . (H. and A.). Bogdan gives 2.547 gms at  $25^\circ$ .

SOLUBILITY OF PHENYL THIO UREA IN AQUEOUS SALT  
SOLUTIONS AT 20°.

(Biltz; Rothmund.)

Salt Solution.	Millimols and also Gms. CS(NH <sub>2</sub> )NHC <sub>6</sub> H <sub>5</sub> Dissolved per Liter of Aqueous Salt Solution of Concentration:							
	0.125 Normal		0.25 Normal		0.5 Normal		1.0 Normal	
	Millimols.	Gms.	Millimols.	Gms.	Millimols.	Gms.	Millimols.	Gms.
$\frac{1}{2}$ AlCl <sub>3</sub>	12.95	1.97	12.82	1.96	12.03	1.83	10.69	1.61
NH <sub>4</sub> NO <sub>3</sub>	14.17	2.15	14.4	2.21	14.53	2.22	14.91	2.27
$\frac{1}{2}$ (NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub>	13.51	2.05	12.84	1.96	11.78	1.79	9.98	1.52
$\frac{1}{2}$ BaCl <sub>2</sub>	13.12	1.99	12.92	1.97	12.22	1.86	10.44	1.59
$\frac{1}{2}$ Ba(NO <sub>3</sub> ) <sub>2</sub>	13.98	2.13	13.98	2.13	13.90	2.12	...	...
CsNO <sub>3</sub>	14.53	2.21	14.90	2.27	15.23	2.33	...	...
LiNO <sub>3</sub>	13.96	2.13	13.96	2.13	13.93	2.12	13.73	2.10
$\frac{1}{2}$ MgSO <sub>4</sub>	13.40	2.04	12.78	1.95	11.54	1.75	9.43	1.43
KC <sub>2</sub> H <sub>3</sub> O <sub>2</sub>	13.40	2.04	12.95	1.97	12.14	1.85	10.74	1.62
KBr	13.50	2.05	13.35	2.04	12.80	1.95	11.76	1.79
KClO <sub>3</sub>	13.86	2.11	13.60	2.06	13.12	1.99	...	...
KCl	13.40	2.04	12.73	1.94	12.19	1.85	10.54	1.60
KI	14.12	2.15	14.48	2.21	14.31	2.18	14.60	2.23
KNO <sub>3</sub>	13.89	2.12	13.85	2.11	13.52	2.05	12.82	1.96
KNO <sub>2</sub>	14.52	2.21	14.65	2.23	13.80	2.11	12.51	1.92
$\frac{1}{2}$ K <sub>2</sub> SO <sub>4</sub>	13.25	2.03	12.49	1.91	11.11	1.69	8.73	1.33
RbNO <sub>3</sub>	14.22	2.16	14.44	2.19	14.39	2.18	14.22	2.17
$\frac{1}{2}$ Na <sub>2</sub> CO <sub>3</sub>	13.29	2.04	12.52	1.91	11.05	1.68	8.58	1.32
NaClO <sub>3</sub>	13.75	2.09	13.65	2.08	13.07	1.98	12.21	1.86
NaClO <sub>4</sub>	14.15	2.15	14.05	2.14	13.58	2.06	12.56	1.92
NaCl	13.28	2.02	12.83	1.95	11.90	1.81	10.02	1.52
NaI	13.98	2.13	14.07	2.14	14.29	2.18	13.96	2.13
NaNO <sub>3</sub>	13.94	2.12	13.77	2.10	13.32	2.04	12.57	1.92
NaNO <sub>2</sub>	14.34	2.18	13.82	2.11	13.06	1.98	11.52	1.75
$\frac{1}{2}$ Na <sub>2</sub> SO <sub>4</sub>	13.19	2.00	12.35	1.87	10.85	1.63	8.30	1.27

SOLUBILITY OF PHENYL THIO UREA AT 25° IN AQUEOUS  
SOLUTIONS OF.

Potassium Nitrate.

(Bogdan.)

Gms. Mols. KNO <sub>3</sub> per 1000 Gms. H <sub>2</sub> O.	Gms. per 1000 Gms. H <sub>2</sub> O.	
	KNO <sub>3</sub> .	CS(NH <sub>2</sub> ) NHC <sub>6</sub> H <sub>5</sub> .
1.045	105.7	2.38
0.5123	51.84	2.48
0.2026	20.50	2.54
0.1007	10.19	2.56
0.0503	5.09	2.55
0.0333	3.36	2.55

Sodium Nitrate.

(Bogdan.)

Gms. Mols. NaNO <sub>3</sub> per 1000 Gms. H <sub>2</sub> O.	Gms. per 1000 Gms. H <sub>2</sub> O.	
	NaNO <sub>3</sub> .	CS(NH <sub>2</sub> ) NHC <sub>6</sub> H <sub>5</sub> .
1.024	87.14	2.26
0.5065	43.10	2.46
0.2031	17.28	2.51
0.0986	8.39	2.53
0.0540	4.59	2.54
0.0335	2.84	2.54

## SOLUBILITY OF PHENYL THIO UREA IN MIXTURES OF ETHYL ALCOHOL AND WATER AT 25°.

(Holleman and Antusch — Rec. trav. chim. 13, 290, '94.)

Vol. per cent Alcohol.	Gms. CS(NH <sub>2</sub> ) NHC <sub>6</sub> H <sub>5</sub> per 100 Gms. Solvent.	Sp. Gr. of Solutions.	Vol. per cent Alcohol.	Gms. CS(NH <sub>2</sub> ) NHC <sub>6</sub> H <sub>5</sub> per 100 Gms. Solvent.	Sp. Gr. of Solutions.
100	3.59	...	65	3.40	0.9018
95	4.44	0.8200	60	2.80	0.9128
90	4.69	0.8389	50	1.87	0.9317
85	4.99	0.8544	40	1.13	0.9486
80	4.70	0.8679	25	0.56	0.9679
75	4.45	0.8810	15	0.38	0.9788
70	3.92	0.8915	0	0.24	0.9979

## SOLUBILITY OF PHENYL THIO UREA IN AQUEOUS SOLUTIONS OF PROPYL AND OF ETHYL ALCOHOL AT 25°.

(Bagdan.)

## In Propyl Alcohol.

G. Mols. C <sub>3</sub> H <sub>7</sub> OH per 1000 Gms. H <sub>2</sub> O.	Gms. per 1000 Gms. H <sub>2</sub> O	
C <sub>3</sub> H <sub>7</sub> OH.	CS(NH <sub>2</sub> ) NHC <sub>6</sub> H <sub>5</sub> .	
1.035	62.10	3.587
0.5448	32.688	3.124
0.1059	6.354	2.643
0.05526	3.316	2.599
0.04854	2.912	2.586

## In Ethyl Alcohol.

G. Mols. C <sub>2</sub> H <sub>5</sub> OH per 1000 Gms. H <sub>2</sub> O.	Gms. per 1000 Gms. H <sub>2</sub> O	
C <sub>2</sub> H <sub>5</sub> OH.	CS(NH <sub>2</sub> ) NHC <sub>6</sub> H <sub>5</sub> .	
1.1010	49.60	3.193
0.5355	24.12	2.931
0.1094	4.932	2.629
0.05018	2.26	2.589
0.03271	1.473	2.577

## In Propyl Alcohol at 0°.

1.000	60.06	1.21
0.100	6.01	1.047

## SOLUBILITY OF PHENYL THIO UREA IN AQUEOUS SOLUTIONS OF ACETONE, MANNITE, CANE SUGAR, DEXTROSE, AND UREA.

(Bagdan.)

Aqueous Non Electro- lyte.	t°.	Gms. per 1000 Gms. H <sub>2</sub> O		Aqueous Non Electro- lyte.	t°.	Gms. per 1000 Gms. H <sub>2</sub> O	
		Non Elec- trolyte.	CS(NH <sub>2</sub> ) NH.C <sub>6</sub> H <sub>5</sub> .			Non Elec- trolyte.	CS(NH <sub>2</sub> ) NHC <sub>6</sub> H <sub>5</sub> .
(CH <sub>3</sub> ) <sub>2</sub> CO	25	7.478	2.667	C <sub>6</sub> H <sub>12</sub> O <sub>6</sub>	25	180.40	3.042
"	"	2.513	2.579	"	"	90.46	2.83
"	"	1.908	2.573	"	"	29.29	2.69
C <sub>6</sub> H <sub>5</sub> (OH) <sub>6</sub>	"	182.11	3.04	"	"	18.01	2.654
"	"	91.05	2.78	"	"	9.554	2.603
C <sub>12</sub> H <sub>22</sub> O <sub>11</sub>	25	338.6	3.457	CO(NH <sub>2</sub> ) <sub>2</sub>	"	63.08	3.306
"	"	170.4	3.015	"	"	29.93	2.892
"	"	34.36	2.634	"	"	6.132	2.618
"	"	18.28	2.596	"	"	4.942	2.605
"	"	10.09	2.572	"	"	2.009	2.572
"	0	342.18	1.420	"	0	60.11	1.310
"	"	34.22	1.044	"	"	6.01	1.048

**URETHANE**  $\text{CO}(\text{NH}_2)\text{OC}_2\text{H}_5$ . SOLUBILITY IN SEVERAL SOLVENTS.

(Speyers—Am. J. Sci. [4] 14, 294, '02.) See also Ethyl Carbamate, p. 138.

Interpolated and calculated from the original results which are given in terms of molecules Urethane per 100 Mols. solvent.

Solubility in Water.				Solubility in Methyl Alcohol.			
t°.	Wt. of 1 cc. Solu- tion.	Mols. $\text{CO}(\text{NH}_2)$ $\text{OC}_2\text{H}_5$ per 100 Mols. $\text{H}_2\text{O}$ .	Gms. $\text{CO}(\text{NH}_2)$ $\text{OC}_2\text{H}_5$ per 100 Gms. $\text{H}_2\text{O}$ .	Wt. of 1 cc. Solu- tion.	Mols. $\text{CO}(\text{NH}_2)$ $\text{OC}_2\text{H}_5$ per 100 Mols. $\text{CH}_3\text{OH}$ .	Gms. $\text{CO}(\text{NH}_2)$ $\text{OC}_2\text{H}_5$ per 100 Gms. $\text{CH}_3\text{OH}$ .	
0	1.023	3.61	17.8	0.956	31.18	86.76	
10	1.033	6.0	29.7	0.977	41.0	114.1	
15	1.042	15.0	74.2	0.989	47.5	132.1	
20	1.060	31.0	153.3	1.000	54.5	151.7	
25	1.073	50.0	247.3	1.013	62.5	173.9	
30	1.078	65.0	321.4	1.024	72.0	200.3	
40	1.065	77.0	380.7	1.045	89.0	247.7	

Solubility in Ethyl Alcohol.				Solubility in Propyl Alcohol.			
t°.	Wt. of 1 cc. Solu- tion.	Mols. $\text{CO}(\text{NH}_2)$ $\text{OC}_2\text{H}_5$ per 100 Mols. $\text{C}_2\text{H}_5\text{OH}$ .	Gms. $\text{CO}(\text{NH}_2)$ $\text{OC}_2\text{H}_5$ per 100 Gms. $\text{C}_2\text{H}_5\text{OH}$ .	Wt. of 1 cc. Solu- tion.	Mols. $\text{CO}(\text{NH}_2)$ $\text{OC}_2\text{H}_5$ per 100 Mols. $\text{C}_3\text{H}_7\text{OH}$ .	Gms. $\text{CO}(\text{NH}_2)$ $\text{OC}_2\text{H}_5$ per 100 Gms. $\text{C}_3\text{H}_7\text{OH}$ .	
0	0.8914	23.91	46.26	0.880	19.48	28.9	
10	0.930	36.0	69.6	0.906	31.0	46.0	
15	0.950	43.0	89.2	0.923	40.0	59.3	
20	0.968	50.0	96.7	0.942	51.0	75.7	
25	0.985	59.0	114.1	0.963	60.0	89.0	
30	1.001	70.0	135.4	0.983	68.0	100.9	
40	1.035	88.0	170.2	1.025	85.0	126.1	

Solubility in Chloroform.				Solubility in Toluene.			
t°.	Wt. of 1 cc. Solu- tion.	Mols. $\text{CO}(\text{NH}_2)$ $\text{OC}_2\text{H}_5$ per 100 Mols. $\text{CHCl}_3$ .	Gms. $\text{CO}(\text{NH}_2)$ $\text{OC}_2\text{H}_5$ per 100 Gms. $\text{CHCl}_3$ .	Wt. of 1 cc. Solu- tion.	Mols. $\text{CO}(\text{NH}_2)$ $\text{OC}_2\text{H}_5$ per 100 Mols. $\text{C}_6\text{H}_5\text{CH}_3$ .	Gms. $\text{CO}(\text{NH}_2)$ $\text{OC}_2\text{H}_5$ per 100 Gms. $\text{C}_6\text{H}_5\text{CH}_3$ .	
0	1.404	27.56	20.6	0.887	1.77	1.71	
10	1.340	41	30.6	0.874	5.0	4.84	
15	1.310	46	34.4	0.875	10.0	9.68	
20	1.280	53	39.6	0.883	16.0	15.48	
25	1.240	60	44.8	0.902	25.0	24.18	
30	1.203	67	50.0	0.927	44.0	42.58	
40	1.125	80	59.7	0.995	85.0	82.24	

**URIC ACID**  $\text{C}_5\text{H}_4\text{N}_4\text{O}_3$ . SOLUBILITY IN WATER.

(Blarez and Deniges—Compt. rend. 104, 1847, '87; at 15° Magnier—Bull. Soc. chim. [2] 23, 483, '75.)

t°.	Gms. $\text{C}_5\text{H}_4\text{N}_4\text{O}_3$ per 100 Gms. $\text{H}_2\text{O}$ .	t°.	Gms. $\text{C}_5\text{H}_4\text{N}_4\text{O}_3$ per 100 Gms. $\text{H}_2\text{O}$ .	t°.	Gms. $\text{C}_5\text{H}_4\text{N}_4\text{O}_3$ per 100 Gms. $\text{H}_2\text{O}$ .
0	0.002	30	0.0088	70	0.0305
10	0.0037	40	0.0122	80	0.0390
15	0.0053	50	0.0170	90	0.0498
20	0.006	60	0.0230	100	0.0625



**VALERIANIC ACID**

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**VALERIANIC ACID**  $n$   $\text{CH}_3(\text{CH}_2)_3\text{COOH}$  ( $n$  Propyl acetic acid — Pentane acid) when shaken with water at  $16^\circ$  two layers are formed.

100 gms. of the aqueous layer contains 3.4 gms.  $\text{CH}_3(\text{CH}_2)_3\text{COOH}$ .

100 gms. of the acid layer contains 90.4 gms.  $\text{CH}_3(\text{CH}_2)_3\text{COOH}$ .

(Lieben and Rossi — *Liebig's Ann.* 150, 60, '71.)

**YTTRIUM IODATE**  $\text{Y}(\text{IO}_3)_3 \cdot 3\text{H}_2\text{O}$ .

100 gms.  $\text{H}_2\text{O}$  dissolve 0.53 gm. yttrium iodate.

(Berlin.)

**YTTRIUM SULPHATE**  $\text{Y}_2(\text{SO}_4)_3$ .

100 gms.  $\text{H}_2\text{O}$  dissolve 15.2 gms.  $\text{Y}_2(\text{SO}_4)_3$  at ord. temperature, 9.3 gms.  $\text{Y}_2(\text{SO}_4)_3 \cdot 8\text{H}_2\text{O}$  at ord. temp. and 4.8 gms.  $\text{Y}_2(\text{SO}_4)_3 \cdot 8\text{H}_2\text{O}$  at  $100^\circ$ .

(Cleve — *Bull. soc. chim.* [2] 21, 344, '74.)

**YTTERBIUM SULPHATE**  $\text{Yb}_2(\text{SO}_4)_3 \cdot 8\text{H}_2\text{O}$ .

## SOLUBILITY IN WATER.

(Cleve — *Z. anorg. Chem.* 32, 143, '02.)

$t^\circ$ .	Gms. $\text{Yb}_2(\text{SO}_4)_3$ per 100 gms. $\text{H}_2\text{O}$ .	$t^\circ$ .	Gms. $\text{Yb}_2(\text{SO}_4)_3$ per 100 Gms. $\text{H}_2\text{O}$ .	$t^\circ$ .	Gms. $\text{Yb}_2(\text{SO}_4)_3$ per 100 Gms. $\text{H}_2\text{O}$ .
0	44.2	55	11.5	80	6.02
15.5	34.6	60	10.4	90	5.83
35	19.1	70	7.22	100	4.67

**ZINC ACETATE**  $\text{Zn}(\text{CH}_3\text{COO})_2 \cdot 2\text{H}_2\text{O}$ .

100 gms.  $\text{H}_2\text{O}$  dissolve 40 gms. at  $25^\circ$  and 66.6 gms. at b. pt.

100 gms. alcohol dissolve 2.8 gms. at  $25^\circ$  and 166.0 gms. at b.pt.

(U. S. P.)

**ZINC BENZOATE**  $\text{Zn}(\text{C}_6\text{H}_5\text{O}_2)_2$ .

## SOLUBILITY IN WATER.

(Paietta — *Gazz. chim. ital.* 36, II, 67, '06.)

$t^\circ$ .	15.9°	17°	27.8°	31.3°	37.5°	49.8°	59°
Gms. $\text{Zn}(\text{C}_6\text{H}_5\text{O}_2)_2$ per 100 gms. aq. solution	2.55	2.49	2.41	2.05	1.87	1.62	1.45

**ZINC BROMIDE**  $\text{ZnBr}_2$ .

## SOLUBILITY IN WATER.

(Dietz — *Wiss. Abh. p. t. Reizhanstalt* 3, 431, '00; see also Etard — *Ann. chim. phys.* [7] 2, 536, '94.)

$t^\circ$ .	Gms. $\text{ZnBr}_2$ per 100 Gms. Solution.	Mols. $\text{ZnBr}_2$ per 100 Mols. $\text{H}_2\text{O}$ .	Solid Phase.	$t^\circ$ .	Gms. $\text{ZnBr}_2$ per 100 Gms. Solution.	Mols. $\text{ZnBr}_2$ per 100 Mols. $\text{H}_2\text{O}$ .	Solid Phase.
-15	77.13	27.0	$\text{ZnBr}_2 \cdot 3\text{H}_2\text{O}$	25	82.46	37.6	$\text{ZnBr}_2 \cdot 2\text{H}_2\text{O}$
-10	78.45	29.1	"	30	84.08	42.3	"
-5	80.64	33.3	"	37	86.20	50.0	"
-8	79.06	30.2	$\text{ZnBr}_2 \cdot 2\text{H}_2\text{O}$	35	85.45	46.9	$\text{ZnBr}_2$
0	79.55	31.1	"	40	85.53	47.4	"
+13	80.76	33.5	"	60	86.08	49.5	"
18	81.46	35.1	"	80	86.57	51.5	"
				100	87.05	53.8	"

**ZINC CARBONATE  $\text{ZnCO}_3$ .**

One liter  $\text{H}_2\text{O}$  dissolves 0.01 gm. at  $15^\circ$ .

One liter aq. 5.85 per cent NaCl solution dissolves 0.0586 gm. at  $14^\circ$ .

One liter aq. 7.45 per cent NaCl solutions dissolves 0.0477 gm. at  $14^\circ$ .

(Cantoni and Passamanik — Ann. chim. anal. appl. 10, 258, '05.)

**ZINC CHLORATE  $\text{ZnClO}_3$ .****SOLUBILITY IN WATER.**

(Meusser — Ber. 35, 1417, '02; at  $18^\circ$ ; Mylius and Funk — Ber. 30, 1718, '97.)

$t^\circ$ .	Gms. $\text{Zn}(\text{ClO}_3)_2$ per 100 gms. Solution.	Mols. $\text{Zn}(\text{ClO}_3)_2$ per 100 Mols. $\text{H}_2\text{O}$ .	Solid Phase.	$t^\circ$ .	Gms. $\text{Zn}(\text{ClO}_3)_2$ per 100 Gms. Solution.	Mols. $\text{Zn}(\text{ClO}_3)_2$ per 100 Mols. $\text{H}_2\text{O}$ .	Solid Phase.
-18	55.62	9.70	$\text{Zn}(\text{ClO}_3)_2 \cdot 6\text{H}_2\text{O}$	30	76.66	16.20	$\text{Zn}(\text{ClO}_3)_2 \cdot 4\text{H}_2\text{O}$
0	59.19	11.08	"	40	69.06	17.29	"
8	60.20	11.72	"	55	75.44	24.00	"
15	67.32	15.96	"	Ice curve			
18	66.52	15.39	$\text{Zn}(\text{ClO}_3)_2 \cdot 4\text{H}_2\text{O}$	-13	30.27	3.36	Ice
				-9	26.54	2.80	"

Sp. Gr. of solution saturated at  $18^\circ = 1.916$ .

**ZINC CHLORIDE  $\text{ZnCl}_2$ .****SOLUBILITY IN WATER.**

(Mylius and Dietz — Z. anorg. Chem. 44, 217, '05; see also Dietz — Wiss. Abh. p. t. Reichsanstalt 3, 429, '00; Etard — Ann. chim. phys. [7] 2, 536, '94.)

$t^\circ$ .	Gms. $\text{ZnCl}_2$ per 100 Gms. Water. Solution.		Solid Phase.	$t^\circ$ .	Gms. $\text{ZnCl}_2$ per 100 Gms. Water. Solution.		Solid Phase.
-5	14	12.3	Ice	9	360	78.3	$.2\frac{1}{2}\text{H}_2\text{O} + \text{H}_2\text{O}$
-10	25	20.0	"	6	385	79.4	$\text{ZnCl}_2 \cdot 2\frac{1}{2}\text{H}_2\text{O}$
-40	83	45.3	"	6	298	74.9	$\text{ZnCl}_2 \cdot 1\frac{1}{2}\text{H}_2\text{O}$
-62	104	51.0	Ice + $\text{ZnCl}_2 \cdot 4\text{H}_2\text{O}$	10	330	76.8	"
-50	113	53.0	$\text{ZnCl}_2 \cdot 4\text{H}_2\text{O}$	20	368	78.6	"
-40	127	55.9	"	26	423	80.9	$.1\frac{1}{2}\text{H}_2\text{O} + \text{ZnCl}_2 \cdot \text{H}_2\text{O}$
-30	160	61.5	$.4\text{H}_2\text{O} + .3\text{H}_2\text{O}$	26.3	433	81.2	$.1\frac{1}{2}\text{H}_2\text{O} + \text{ZnCl}_2$
-10	189	65.4	$\text{ZnCl}_2 \cdot 3\text{H}_2\text{O}$	0	342	77.4	$\text{ZnCl}_2 \cdot \text{H}_2\text{O}$
0	208	67.5	"	10	364	78.4	"
+5	230	69.7	"	20	396	79.8	"
6.5	252.4	71.6	"	28	436	81.3	$\text{ZnCl}_2 \cdot \text{H}_2\text{O} + \text{ZnCl}_2$
5	282	73.8	"	31	477	82.7	$\text{ZnCl}_2 \cdot \text{H}_2\text{O}$
0	309	75.5	$.3\text{H}_2\text{O} + .1\frac{1}{2}\text{H}_2\text{O}$	25	432	81.2	$\text{ZnCl}_2$
0	235	70.1	$\text{ZnCl}_2 \cdot 2\frac{1}{2}\text{H}_2\text{O}$	40	452	81.9	"
6.5	252	71.6	$.2\frac{1}{2}\text{H}_2\text{O} + .3\text{H}_2\text{O}$	60	488	83.0	"
10	272	73.1	$\text{ZnCl}_2 \cdot 2\frac{1}{2}\text{H}_2\text{O}$	80	543	84.4	"
12.5	303	75.2	"	100	615	86.0	"
11.5	335	77.0	$.2\frac{1}{2}\text{H}_2\text{O} + .1\frac{1}{2}\text{H}_2\text{O}$	262	$\infty$	100.0	"

**ZINC CYANIDE  $\text{Zn}(\text{CN})_2$ .**

100 cc. concentrated  $\text{Zn}(\text{C}_2\text{H}_3\text{O}_2)_2 + \text{Aq.}$  dissolve 0.4 gm.  $\text{Zn}(\text{CN})_2$ .

100 cc. concentrated  $\text{ZnSO}_4 + \text{Aq.}$  dissolves 0.2 gm. (Joannis.)

SOLUBILITY OF ZINC CHLORIDE, AMMONIUM CHLORIDE MIXTURES  
IN WATER.

(Meerburg — Z. anorg. Chem. 37, 212, '03.)

Isotherm for 0°.			Isotherm for 20°.			Isotherm for 30°.		
Gms. per 100 Gms. Solution.		Solid Phase.	Gms. per 100 Gms. Solution.		Solid Phase.	Gms. per 100 Gms. Solution.		Solid Phase.
ZnCl <sub>2</sub> .	NH <sub>4</sub> Cl.		ZnCl <sub>2</sub> .	NH <sub>4</sub> Cl.		ZnCl <sub>2</sub> .	NH <sub>4</sub> Cl.	
0	22.8	NH <sub>4</sub> Cl	0.0	26.9	NH <sub>4</sub> Cl	0.0	29.5	NH <sub>4</sub> Cl
3.5	23.0	"	5.1	27.1	"	9.2	29.4	"
7.1	23.5	"	9.5	27.4	"	16.0	29.7	"
10.2	23.9	"	12.7	27.5	"	20.2	30.1	"
15.1	24.7	"	15.7	27.7	"	24.7	30.4	"
18.0	25.3	"	18.0	27.9	"	26.3	30.8	NH <sub>4</sub> Cl + a
22.4	26.0	"	23.5	29.0	"	27.2	30.2	a
24.2	26.1	"	26.0	29.5	NH <sub>4</sub> Cl + a	30.1	29.6	"
25.7	26.3	NH <sub>4</sub> Cl + a	29.5	28.1	a	36.8	28.2	"
27.5	26.4	a	32.3	27.7	"	42.4	27.3	"
30.7	25.7	"	35.8	27.0	"	43.8	27.3	a + b
33.9	25.3	"	38.7	26.9	"	45.0	24.4	b
38.8	24.4	"	40.2	26.6	"	51.2	17.6	"
42.6	24.6	a + b	41.9	26.3	"	61.9	10.4	"
44.3	21.3	b	43.2	26.0	a + b	66.9	9.2	ZnCl <sub>2</sub> + b
49.2	15.3	"	46.9	21.0	b	75.6	6.1	ZnCl <sub>2</sub>
52.6	11.9	"	53.2	14.5	"	70.3	7.6	"
55.4	10.0	"	58.4	11.1	"	78.5	3.2	"
59.3	7.5	"	62.7	8.7	"	76.9	3.5	"
62.1	6.8	"	66.6	7.9	"	79.8	1.6	"
						81.6	0.0	"

a = ZnCl<sub>2</sub>·3NH<sub>4</sub>Cl. b = ZnCl<sub>2</sub>·2NH<sub>4</sub>Cl.100 gms. abs. acetone dissolve 43.5 gms. ZnCl<sub>2</sub> at 18°.

(Naumann — Ber. 37, 4332, '04.)

100 gms. glycerine dissolve 50 gms. ZnCl<sub>2</sub> at 15.5°.**ZINC FLUORIDE** ZnF<sub>2</sub>·4H<sub>2</sub>O.

One liter of water dissolves 16 gms. at 18°.

(Dietz.)

**ZINC HYDROXIDE** Zn(OH)<sub>2</sub>.

One liter of water dissolves 0.0042 gm. ZnO at 18°, conductivity method.

(Dupre and Bratas — Z. angew. Chem. 16, 55, '03.)

SOLUBILITY OF ZINC HYDROXIDE IN ONE PER CENT AQUEOUS  
SALT SOLUTIONS AT 16°–20°.

(Snyder — Ber. 11, 936, '78.)

The CO<sub>2</sub> free Zn(OH)<sub>2</sub> dissolved is calculated as milligrams Zn per liter of the given salt solution. Additional determinations are also given.

Aq. Salt Solution.	Mgs. Zn per Liter Solution.	Aq. Salt Solution.	Mgs. Zn per Liter Solution.	Aq. Salt Solution.	Mgs. Zn per Liter Solution.
NaCl	51	K <sub>2</sub> SO <sub>4</sub>	37.5	K <sub>2</sub> CO <sub>3</sub>	0
KCl	43	MgSO <sub>4</sub>	27	NH <sub>4</sub> Cl	95
CaCl <sub>2</sub>	57.5	KNO <sub>3</sub>	17.5	NH <sub>4</sub> NO <sub>3</sub>	77
MgCl <sub>2</sub>	65	Ba(NO <sub>3</sub> ) <sub>2</sub>	25	(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub>	88
BaCl <sub>2</sub>	38				

**SOLUBILITY OF ZINC HYDROXIDE IN AQUEOUS SOLUTIONS OF:  
Ammonia and Ammonia Bases**

at 17°-19°.  
(Herz — Z. anorg. Chem. 30, 281, '02.)

Normality of the Base.	Normality of Dis- solved Zn.	Gms. ZnO per 20 cc. Solution.
0.0942NH <sub>3</sub>	0.0011	0.00185
0.236 "	0.0110	0.0180
0.707 "	0.059	0.0958
0.0944NH <sub>2</sub> CH <sub>3</sub>	0.0005	0.0008
0.472 "	0.0081	0.0132
0.944 "	0.03	0.0484
0.068 NH <sub>2</sub> C <sub>2</sub> H <sub>5</sub>	0.0003	0.0005
0.51 "	0.0045	0.0074
0.68 "	0.0098	0.0161

**Sodium Hydroxide at  
Ord. Temp.**

(Rubenbauer — *Ibid.* 30, 333, '02.)

Gms. per 20 cc. Solution		Mol. Dilution of the NaOH.
Na.	Zn.	
0.1012	0.0040	4.50
0.1978	0.0150	2.33
0.4278	0.0442	1.06
0.6670	0.1771	0.70
0.9660	0.9630	0.48
1.4951	0.2481	0.31
2.9901	0.3700	0.16
Moist Zn (OH) <sub>2</sub> used. So- lutions shaken 5 hours.		

**ZINC IODATE Zn(IO<sub>3</sub>)<sub>2</sub>.**

100 gms. H<sub>2</sub>O dissolve 0.87 gm. Zn(IO<sub>3</sub>)<sub>2</sub> cold and 1.31 gms. hot.

(Rammelsberg — Pogg. Ann. 43, 665, '38.)

**ZINC IODIDE ZnI<sub>2</sub>.**

**SOLUBILITY IN WATER.**

(Diets — Wiss. Abh. p. t. Reichanstalt 3, 432, '00; see also Etard — Ann. chim. phys. [7] 2, 526, '94.)

t°.	Gms. ZnI <sub>2</sub> per 100 Gms. Solution.	Mols. ZnI <sub>2</sub> per 100 Mols. H <sub>2</sub> O.	Solid Phase.	t°.	Gms. ZnI <sub>2</sub> per 100 Gms. Solution.	Mols. ZnI <sub>2</sub> per 100 Mols. H <sub>2</sub> O.	Solid Phase.
-10	80.50	23.3	ZnI <sub>2</sub> ·2H <sub>2</sub> O	0	81.11	24.2	ZnI <sub>2</sub>
-5	80.77	23.7	"	18	81.20	24.4	"
0	81.16	24.3	"	40	81.66	25.1	"
+10	82.06	25.8	"	60	82.37	26.4	"
22	83.12	27.8	"	80	83.05	27.5	"
27	89.52	50.3	"	100	83.62	28.7	"

Sp. Gr. of sat. solution of the anhydrous salt at 18° = 2.725.

100 gms. glycerine dissolve 40 gms. ZnI<sub>2</sub> at 15.5°.

**ZINC NITRATE Zn(NO<sub>3</sub>)<sub>2</sub>.**

**SOLUBILITY IN WATER.**

(Funk — Wiss. Abh. p. t. Reichanstalt, 3, 438, '00.)

t°.	Gms. Zn(NO <sub>3</sub> ) <sub>2</sub> per 100 Gms. Solution.	Mols. Zn(NO <sub>3</sub> ) <sub>2</sub> per 100 Mols. H <sub>2</sub> O.	Solid Phase.	t°.	Gms. Zn(NO <sub>3</sub> ) <sub>2</sub> per 100 Gms. Solution.	Mols. Zn(NO <sub>3</sub> ) <sub>2</sub> per 100 Mols. H <sub>2</sub> O.	Solid Phase.
-25	40.12	6.36	Zn(NO <sub>3</sub> ) <sub>2</sub> ·9H <sub>2</sub> O	18	53.50	10.9	Zn(NO <sub>3</sub> ) <sub>2</sub> ·6H <sub>2</sub> O
-22.5	40.75	6.54	"	25	55.90	12.0	"
-20	42.03	6.89	"	36.4	63.63	16.7	"
-18	43.59	7.34	"	36	64.63	17.4	"
-18	44.63	7.67	Zn(NO <sub>3</sub> ) <sub>2</sub> ·6H <sub>2</sub> O	33.5	65.83	18.3	"
-15	45.26	7.86	"	37	66.38	18.8	Zn(NO <sub>3</sub> ) <sub>2</sub> ·3H <sub>2</sub> O
-13	45.51	7.94	"	40	67.42	19.7	"
-12	45.75	8.01	"	41	68.21	20.4	"
0	48.66	9.01	"	43	69.26	21.4	"
+12.5	52.0	10.3	"	45.5	77.77	33.3	"

## ZINC OXALATE

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### ZINC OXALATE $\text{ZnC}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$ .

One liter of water dissolve 0.083 Mg. equiv. = 0.0064 gm.  $\text{ZnC}_2\text{O}_4$  at 18°.

(Kohlrausch — Z. physik. Chem. 50, 356, '04-'05.)

### ZINC SULPHATE $\text{ZnSO}_4$ .

#### SOLUBILITY IN WATER.

(Cohen — Z. physik. Chem. 34, 180, '00; at 50°; Callender and Barnes — Proc. Roy. Soc. 62, 149, '97; Etard — Ann. chim. phys. [7] 2, 536, '94; Poggiale *Ibid.* [3] 8, 467, '43; Mulder.)

t °.	Gms. $\text{ZnSO}_4$ per 100 Gms.		Solid Phase.	t °.	Gms. $\text{ZnSO}_4$ per 100 Gms.		Solid Phase.
	Solution.	Water.			Solution.	Water.	
— 5	28.21	39.30	$\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$	25	38.94	63.74	$\text{ZnSO}_4 \cdot 6\text{H}_2\text{O}$
0.1	29.54	41.93	"	39	41.22	70.06	$6\text{H}_2\text{O} + .7\text{H}_2\text{O}$
9.1	32.01	47.09	"	50	43.45	76.84	$\text{ZnSO}_4 \cdot 6\text{H}_2\text{O}$
15	33.81	50.88	"	70	47.5	88.7	$6\text{H}_2\text{O} + .5\text{H}_2\text{O}$
25	36.67	57.90	"	80	46.4	86.6	$\text{ZnSO}_4 \cdot \text{H}_2\text{O}$
35	39.98	66.61	"	90	45.5	83.7	"
39	41.21	70.05	"	100	44.7	80.8	"
— 5	32.00	47.08	$\text{ZnSO}_4 \cdot 6\text{H}_2\text{O}$	120	41.7	71.5	"
01	33.09	49.48	"	140	38.0	61.3	"
				160	33.0	49.3	"

100 gms. abs. methyl alcohol dissolve 0.65 gm.  $\text{ZnSO}_4$  at 18°, 5.90 gms.  $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$  at 18°.

100 gms. 50 per cent methyl alcohol dissolve 15.7 gms.  $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$  at 18°.

(de Bruyn — Z. physik. Chem. 10, 783, '92.)

#### SOLUBILITY OF ZINC SULPHATE IN AQUEOUS ETHYL ALCOHOL.

(Schiff — Liebig's Ann. 118, 365, '61.)

Concentration of Alcohol	10 per cent	20 per cent	40 per cent
Gms. $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$ per 100			
Gms. Solution	51.1	39.0	3.45

100 gms. glycerine dissolve 35 gms. zinc sulphate at 15.5°.

**SOLUBILITY OF ZINC SULPHATE—SODIUM SULPHATE MIXTURES  
IN WATER.**

(Koppel — Gumpert — Z. physik. Chem. 52, 409, '05.)

t°.	Gms. per 100 Gms. Solution.		Gms. per 100 Gms. H <sub>2</sub> O.		Mols. per 100 Mols. H <sub>2</sub> O.		Solid Phase.
	ZnSO <sub>4</sub> .	Na <sub>2</sub> SO <sub>4</sub> .	ZnSO <sub>4</sub> .	Na <sub>2</sub> SO <sub>4</sub> .	ZnSO <sub>4</sub> .	Na <sub>2</sub> SO <sub>4</sub> .	
0	27.19	5.33	40.30	7.90	4.50	1.01	} ZnSO <sub>4</sub> ·7H <sub>2</sub> O + Na <sub>2</sub> SO <sub>4</sub> ·10H <sub>2</sub> O
5	27.85	6.27	42.28	9.52	4.71	1.21	
25	17.58	15.63	26.32	23.40	2.94	2.96	ZnNa <sub>2</sub> (SO <sub>4</sub> ) <sub>2</sub> ·4H <sub>2</sub> O
30	17.66	15.58	26.47	23.44	2.95	2.97	"
35	17.59	15.70	26.36	23.52	2.94	2.98	"
40	17.75	15.72	26.68	23.63	2.98	2.99	"
10	29.16	7.16	45.79	11.24	5.11	1.42	} ZnNa <sub>2</sub> (SO <sub>4</sub> ) <sub>2</sub> ·4H <sub>2</sub> O + ZnSO <sub>4</sub> ·7H <sub>2</sub> O
15	30.70	6.40	48.81	10.17	5.45	1.29	
20	32.51	5.36	52.34	8.62	5.84	1.09	
25	34.36	4.41	56.15	7.22	6.27	0.91	
30	36.28	3.80	60.55	6.34	6.76	0.81	} ZnNa <sub>2</sub> (SO <sub>4</sub> ) <sub>2</sub> ·4H <sub>2</sub> O + ZnSO <sub>4</sub> ·6H <sub>2</sub> O
35	38.18	3.30	65.25	5.64	7.28	0.71	
38	38.83	2.90	66.64	4.98	7.44	0.63	
40	38.26	2.78	64.89	4.71	7.24	0.60	
10	27.91	7.92	43.50	12.34	4.85	1.565	} ZnNa <sub>2</sub> (SO <sub>4</sub> ) <sub>2</sub> ·4H <sub>2</sub> O + Na <sub>2</sub> SO <sub>4</sub> ·10H <sub>2</sub> O
15	24.28	10.90	36.92	16.71	4.12	2.12	
20	19.14	14.58	28.77	21.95	3.21	2.79	
25	13.31	19.94	19.93	29.87	2.22	3.785	
30	6.96	27.75	10.67	42.51	1.19	5.39	} ZnNa <sub>2</sub> (SO <sub>4</sub> ) <sub>2</sub> ·4H <sub>2</sub> O + Na <sub>2</sub> SO <sub>4</sub>
35	5.61	30.03	8.72	46.61	0.971	5.91	
40	5.96	28.65	9.16	43.83	1.02	5.555	

**ZINC SULPHITE** ZnSO<sub>3</sub>·2H<sub>2</sub>O.

100 gms. H<sub>2</sub>O dissolve 0.16 gm. ZnSO<sub>3</sub>·2H<sub>2</sub>O.

(Houston and Trichborne — Brit. Med. Jour. 1903, '90.)

**ZINC TARTRATE** C<sub>4</sub>H<sub>4</sub>O<sub>6</sub>·Zn·2H<sub>2</sub>O.

**SOLUBILITY IN WATER.**

(Cantoni and Zachoder — Bull. Soc. chim. [3] 33, 751, '05.)

t°.	Gms. C <sub>4</sub> H <sub>4</sub> O <sub>6</sub> ·Zn·2H <sub>2</sub> O per 100 cc. Solution.	t°.	Gms. C <sub>4</sub> H <sub>4</sub> O <sub>6</sub> ·Zn·2H <sub>2</sub> O per 100 cc. Solution.	t°.	Gms. C <sub>4</sub> H <sub>4</sub> O <sub>6</sub> ·Zn·2H <sub>2</sub> O per 100 cc. Solution.
15	0.019	40	0.060	65	0.100
20	0.022	45	0.073	70	0.088
25	0.036	50	0.087	75	0.078
30	0.041	55	0.116	80	0.059
35	0.055	60	0.104	85	0.041

**ZINC VALERATE** (C<sub>4</sub>H<sub>9</sub>COO)<sub>2</sub>Zn·2H<sub>2</sub>O.

100 gms. H<sub>2</sub>O dissolve 2 gms. (C<sub>4</sub>H<sub>9</sub>COO)<sub>2</sub>Zn·2H<sub>2</sub>O at 25°.

100 gms. alcohol dissolve 2.8 gms. at 25°.

(U. S. P.)

## ADDENDUM

The distribution results shown in the following table were obtained by agitating together equal volumes of olive oil and aqueous solutions of the several narcotics, and determining the dissolved substance present in the aqueous layer before and after the agitation. The sum of the amount of substance in the oil and aqueous layers, as shown in the table, is the amount originally in 100 cc. of each aqueous solution used.

The work was done for the purpose of testing the Overton-Meyer Theory of Narcosis, that the anesthetic action of certain groups of narcotics is proportional to their distribution between water and the fatty material occurring in the nervous system, and olive oil was selected as the solvent best fulfilling the analytical requirements and at the same time offering a fair resemblance to the fatty substance of the nervous system. The results are believed to be of interest both as solubility studies and on account of their connection with the Theory of Narcosis.

The author is indebted to Dr. Reid Hunt of the Hygienic Laboratory for calling his attention to the papers containing the distribution results here tabulated.

# DISTRIBUTION OF SEVERAL SUBSTANCES BETWEEN WATER AND OLIVE OIL.

(At ord. temp., Baum — Archiv. exp. Pathol. u. Pharmacol., 42, 130, '99; at 3°, 30° and 36°; Meyer — *Ibid.* 46, 344, '01; at 15°, Harrass — Archiv. internat. Pharmacodynamie et Therapie, 11, 458, '03.)

Name of Substance.	Formula.	t°.	Gms. Substance per 100 cc.		C(f.) C(w.)
			Water layer (w.).	Olive Oil layer (f.).	
Sulfonal	$(\text{CH}_3)_2\text{C}(\text{SO}_2\text{C}_2\text{H}_5)_2$	ord.	0.0700	0.0686	0.979
Trional	$(\text{CH}_3)(\text{C}_2\text{H}_5)\text{C}(\text{SO}_2\text{C}_2\text{H}_5)_2$	"	0.0404	0.1646	4.074
Tetronal	$(\text{C}_2\text{H}_5)_2\text{C}(\text{SO}_2\text{C}_2\text{H}_5)_2$	"	0.0462	0.1446	3.756
Di methyl sulphon di methyl methane	$(\text{CH}_3)_2\text{C}(\text{SO}_2\text{CH}_3)_2$	"	0.6072	0.0622	0.103
Di ethyl sulphon me- thane	$\text{CH}_3(\text{SO}_2\text{C}_2\text{H}_5)_2$	"	0.610	0.092	0.151
Ethyl urethane	$\text{NH}_2\text{CO}_2\text{C}_2\text{H}_5$	"	4.52	0.615	0.136
Methyl urethane	$\text{NH}_2\text{CO}_2\text{CH}_3$	"	7.50	0.275	0.037
Tertiary butyl alcohol	$(\text{CH}_3)_3\text{C}(\text{OH})\text{CH}_3$	"	8.744	1.539	0.176
Amylene hydrate	$(\text{CH}_3)_2\text{C}(\text{OH})\text{CH}_2\text{CH}_3$	"	6.605	6.605	1.000
Mono acetin	$\text{C}_3\text{H}_7(\text{OH})_2(\text{OC}_2\text{H}_5\text{O})$	"	4.28	0.254	0.059
"	"	3	2.349	0.229	0.099
"	"	36	2.417	0.161	0.066
Di acetin	$\text{C}_3\text{H}_7(\text{OH})(\text{OC}_2\text{H}_5\text{O})_2$	ord.	3.0	0.7	0.234
Tri acetin	$\text{C}_3\text{H}_7(\text{OC}_2\text{H}_5\text{O})_3$	"	2.72	0.80	0.295
Bromal hydrate	$\text{CBr}_3\text{CH}(\text{OH})_2$	"	9.81	6.52	0.665
Butyl chloral hydrate	$\text{C}_4\text{H}_9\text{Cl}_2\text{CH}(\text{OH})_2$	"	2.04	3.24	1.589
Chloral hydrate	$\text{CCl}_3\text{CH}(\text{OH})_2$	"	16.31	3.10	0.190
"	"	"	4.12	0.91	0.22
"	"	3	1.34	0.08	0.053
"	"	30	1.15	0.27	0.237
Salicylamide	$\text{OH.C}_6\text{H}_4.\text{CH}_2\text{NH}_2$	3	0.056	0.126	2.25
"	"	36	0.075	0.107	1.40
Benzamide	$\text{C}_6\text{H}_5\text{ONH}_2$	3	1.062	0.706	0.66
"	"	36	1.235	0.533	0.43
Ethyl alcohol	$\text{C}_2\text{H}_5\text{OH}$	3	2.69	0.09	0.026
"	"	3	3.90	0.07	
"	"	30	2.64	0.14	0.047
"	"	30	3.82	0.16	
Acetone	$(\text{CH}_3)_2\text{CO}$	3	3.07	0.50	0.146
"	"	3	4.14	0.52	
"	"	3	3.92	0.61	
"	"	30	2.73	0.73	0.235
"	"	30	3.86	0.81	
"	"	30	3.71	0.87	
Valeryl di ethyl amide	$\text{CH}_3(\text{CH}_2)_3\text{CON}(\text{C}_2\text{H}_5)_2$	15	0.231	1.339	5.797
Valeryl di methyl amide	$\text{CH}_3(\text{CH}_2)_3\text{CON}(\text{CH}_3)_2$	15	0.911	0.379	0.416
Valeryl ethyl amide	$\text{CH}_3(\text{CH}_2)_3\text{CONH}(\text{C}_2\text{H}_5)$	15	1.029	0.261	0.254
Valer amide	$\text{CH}_3(\text{CH}_2)_3\text{CONH}_2$	15	0.769	0.241	0.313
Lactic acid di ethyl amide	$\text{CH}_3\text{CHOH.CON}(\text{C}_2\text{H}_5)_2$	15	1.256	0.194	0.154
Sodium salicylate	$\text{C}_6\text{H}_4.\text{OH.COONa}$	15	1.444	0.156	0.108





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